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THE RELATION BETWEEN SPEECH SOUND DISCRIMINATION AND PERCENTAGE OF HEARING LOSS*

JEAN UTLEY, M.A.
District No. 76, Public Schools, Evanston, Illinois

I. Introduction

An experiment dealing with two phases of the relation between hearing loss and perception of speech is here reported. Specifically, the questions investigated were:

1. What relations exist between degree of hearing loss at particular frequencies and speech discrimination ability of markedly hard of hearing children?

2. What relations exist between percentage of hearing loss, as estimated by five different methods, and the ability for discrimination of speech sounds evidenced by these children?

In view of past research on the phonetic components of speech fairly definite limits are assumed for both consonant and vowel perception. Therefore, among individuals whose audiograms present insufficient residual hearing to discriminate these phonetic elements, acoustic training would appear worthless. Practical experience with such individuals who have had extensive acoustic training provides evidence, nevertheless, which leads one to believe differently. For this reason it seemed of importance to investigate the relation between hearing loss at specific frequencies and speech perception.

Percentage of hearing loss is a measure often used to estimate the acoustical handicap which a particular loss represents. Several methods for computing percentage of hearing loss, each based on a particular set of assumptions, have been devised. The argument for percentage of hearing loss is that it summarizes the loss in a single numerical measure. The argument against it is well expressed by Bunch (**1**) when he says, "These devices are usually misleading." He cites cases with certain audiograms showing slight percentage losses numerically expressed, who could not, in his opinion, understand speech through hearing at all. His contention is that the effective loss is in some cases

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greater, and in some cases less, than the percentage indicates; and, furthermore, since such estimates are of no practical value the custom of making such statements should be discontinued.

No one would deny, nevertheless, the value of a single numerical measure of hearing loss, provided it could be shown that the measure bears a real relationship to the degree of handicap. Our present need is for a study of relationship between the degree of handicap and measures derived by means of methods for computing hearing loss. A crucial aspect of this problem is the question of the relationship between percentage of hearing loss and ability to discriminate the phonetic elements of speech. One phase of this question constitutes the study herein reported.

II. Procedure

The present study, as already mentioned, dealt with the relations between the ability of markedly hard of hearing children to discriminate speech sounds and selected measures of the severity of hearing loss.

Fifty-one pupils in a school for the deaf, with varying degrees of handicap, were chosen for the study. These pupils ranged in age from 9 years, 2 months to 24 years, 2 months. There were 25 boys and 26 girls. Twenty-one were congenitally deaf with histories of deafness immediately traceable in the family, 12 were deaf from birth with cause unknown, 7 reported deafness due to disease prior to the development of language, 7 were unquestionably deafened due to disease after language was developed, and the cause in 4 cases was undetermined, although there appeared reason to believe it might be otosclerosis.

Individual audiometric tests using the Maico, Model D-5, were made for this group. Threshold of audibility recordings were made by use of the Interrupter Method. The test included eight octave frequencies from 128 to 11,584 and two intermediate frequencies—2,896 and 5,792. Eighty-two per cent of the total number of subjects responded to 2048 and frequencies below, while only 45 per cent responded to 2,896, and the percentage of responses grew less as the frequencies became higher. In view of this fact, it was decided to use the frequency responses from 128 through 2048, only, in the statistical analyses of existing relationships between degree of loss at particular frequencies and speech discrimination ability. All frequencies were considered, of course, in the comparison of percentage of hearing loss as estimated by five different methods and speech discrimination ability.

The children's ability to discriminate speech sounds was measured by a vowel test and a consonant test. These tests were constructed by the writer. The vowel discrimination test included 131 pairs of words, differing only in vowel sound, such as *shoe—show, pole—pull.* Seventeen vowel sounds, including diphthongs, were used. Insofar as possible, each vowel sound was paired with every other in words of one syllable considered basic inasmuch as they were chosen from the International Kindergarten Union List (2), a vocabulary made up of words found to be most frequently used by average six-year-olds. (The reading ability of all pupils in the investigation was known to be of second grade level, at least, as determined by standardized reading tests.) The consonant discrimination test included 254 pairs of words differing only in consonant sound. Twenty-five consonant sounds were included; [ʒ] was not used. Every consonant sound was paired with every other consonant sound, if possible, in pairs such as *such—sung, in—is, good—wood.* These words, likewise, were chosen from the International Kindergarten Union List.

The vowel and consonant tests were presented to the individual subjects on mimeographed sheets. Spaces following each word of the pairs were pro-

vided for the purpose of checking with pencil, for example:

shoe———show———
foot———fought———

Each pair was numbered and care was always maintained to see that all children were in the same place in the test. One word of each pair was pronounced, and the children checked the word they heard or thought they heard. Stimuli were kept constant throughout the experiment. A sufficient number of examples were given to insure complete understanding of the procedure to follow. The entire face of the examiner was covered throughout the administering of the test so that speech reading on the part of the children played no role. The same examiner administered all the tests. The children were tested in groups of ten or twelve.

All tests were presented over a multiple hearing aid, necessitated by the fact that the majority of children presented marked hearing losses. Unless speech was amplified they understood nothing. This hearing aid consisted of a crystal microphone, amplifier adjusted to emphasize the higher frequencies and set to deliver maximum amplification obtainable without overloading, and monaural crystal phones. The earphone was placed on the better ear in each case. The children were familiar with the instrument and the adjustment employed, since it represented the conditions under which all of their academic work in the classroom was being conducted. Moreover, they were receiving daily drill in discrimination of speech sounds. The examiner had had two years of experience in giving these tests and over this period had practiced keeping intensity, rate and articulation as constant as possible.

The number of errors made by each subject on the sound discrimination tests were taken as his score for vowel and consonant discrimination, respectively. The validity of this procedure is open to the criticism that on the basis of chance a person without any discrimination ability would be expected to record 50 per cent correct responses. That this chance factor was operating is indicated by the fact that the most handicapped subjects made about this number of errors and less handicapped subjects scored even fewer errors. The reliability of the tests, however, is well established by correlations of .87 and .87, respectively, obtained when the odd-even and split-half techniques were applied to the total scores made by such a group. It seems justifiable, therefore, to assume that the tests gave a relative measure of discriminatory ability, even though the errors for each subject would be expected to be twice as numerous if the chance factor were eliminated. Furthermore, the simplicity of the response demanded of subjects by the tests recommended their use.

III. Results

After obtaining the pure tone audiometric tests and the scores on vowel and consonant tests for the group of 51 acoustically handicapped children, a number of comparisons were made.

Correlation between Vowel and Consonant Test Scores

When the vowel test scores and consonant test scores were compared by the rank difference method a high positive correlation of .84 was obtained. This suggests that in these subjects the ability to discriminate vowels and consonants were proportionately affected by hearing loss, a conclusion which is borne out by other results of the study.

Correlation between Discrimination Scores and Hearing Loss

In the analyses to follow, scores obtained on the vowel test, consonant test, and a combination of vowel and consonant scores were treated separately. Each combination score was obtained by adding double the score on the vowel test to the score on the consonant test. This was done since about half as many pairs

of words were used in the vowel test as in the consonant test (131 to 254).

The three aforementioned sound discrimination scores were correlated separately with hearing losses as revealed by the audiograms, for each of the following frequencies: 128, 256, 512, 1024 and 2048. Figure 1 and Table I show the results of rank difference correlations between discrimination scores and amount of loss (in decibels) at specific frequencies.

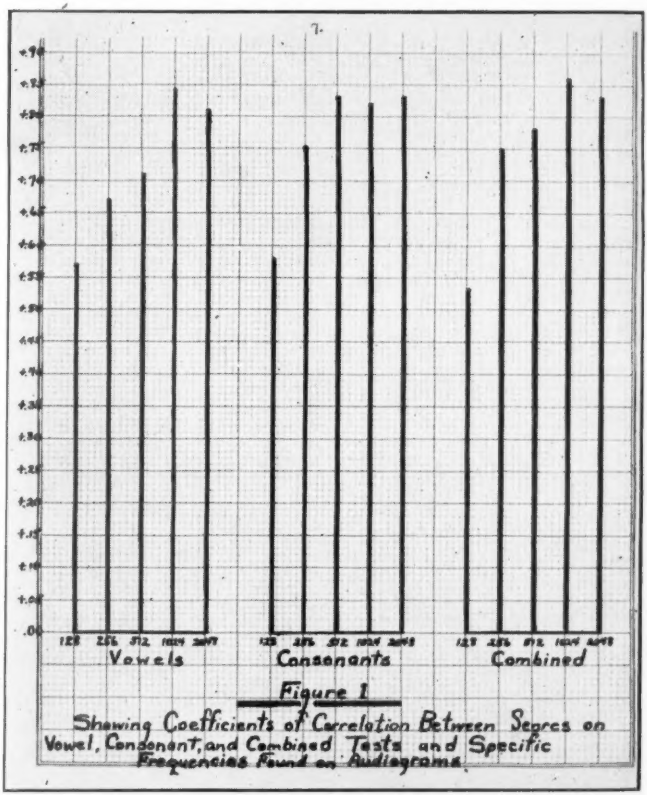

Figure 1

Showing Coefficients of Correlation Between Scores on Vowel, Consonant, and Combined Tests and Specific Frequencies Found on Audiograms.

While the coefficients of correlation are large enough to indicate a positive relation for all comparisons explored, the results show a general tendency for the correlation between discrimination errors and hearing loss to become greater the higher the frequency under consideration. For vowel and combined scores

this trend is regular through 1024 cycles and there is a slight, but statistically insignificant, reversal for 2048 cycles. For the consonant test this trend is followed through 512 cycles but then disappears. It is interesting and challenging to note that for consonant scores the correlation reaches a maximum for 512 cycles, while for the vowel and combined scores this maximum is not reached until the 1024 cycle comparison. Furthermore, the difference at 512 cycles between the correlations of .83 for the consonant test and .71 for the vowel test is great enough that one may assign statistical significance to it. Except to the degree that they represent the trend mentioned above and a general similarity between vowel, consonant and combined measures, differences between all other correlations are small enough to be considered insignificant. The anomoly at 512, however, at least suggests the presumption that in markedly hard of hearing children loss as low as 512 is even more determinative of consonant discrimination than of vowel discrimination.

TABLE I. COEFFICIENTS OF CORRELATION BETWEEN SCORES ON VOWEL, CONSONANT AND COMBINED TESTS AND HEARING LOSS FOR SPECIFIC FREQUENCIES.

Comparisons	*Coefficient of Correlation*
Vowel Scores and 128	.57±.095
" " " 256	.67±.078
" " " 512	.71±.070
" " " 1024	.84±.042
" " " 2048	.81±.049
Consonant Scores and 128	.58±.094
" " " 256	.75±.062
" " " 512	.83±.044
" " " 1024	.82±.045
" " " 2048	.83±.044
Combined Scores and 128	.53±.117
" " " 256	.74±.064
" " " 512	.78±.055
" " " 1024	.86±.037
" " " 2048	.83±.044

Relation between Discrimination Scores and Percentage of Hearing Loss

The second major portion of this study consisted of computing the subjects' percentages of hearing loss from the pure tone audiograms according to five different methods, and comparing the results of these computations with the three measures of sound discrimination. The five methods used for determining percentage of hearing loss were those devised by the American Medical Association (**3**), by Fowler (**4**), by Sabine (**5**), by Western Electric (**6**) and by West (**7**). Because of special adaptations which it was necessary to make in the Fowler and the West methods, explanations regarding these two methods are in order. Directions for computing percentage of hearing loss for speech were followed explicitly in regard to the other three.

West's Method for Vowel and Consonant Perception was chosen as the one, among several suggested by him, most applicable to this investigation. Since the hearing aid used in the present experiment was equipped with monaural phones, however, percentages were computed for only the ear on which the phone was placed. "Better ear" readings were not considered in applying West's method to this study.

Fowler's method was followed with the exception of the computation and consideration of the recruitment factor in the final percentage. In discussing his recruitment "correction" Fowler (4) says, " . . . when there is more than a forty decibel loss because of any kind of deafness, 'recruitment' is of little use . . . one would arrive at a fairer estimate by using the table and ignoring the R. F. and the weightings for speech than by using either or both these weightings and not using the table." Since the majority of the children used in the present study showed more than a 40 db. loss, it seemed legitimate to use the weightings and table but to disregard the recruitment "correction."

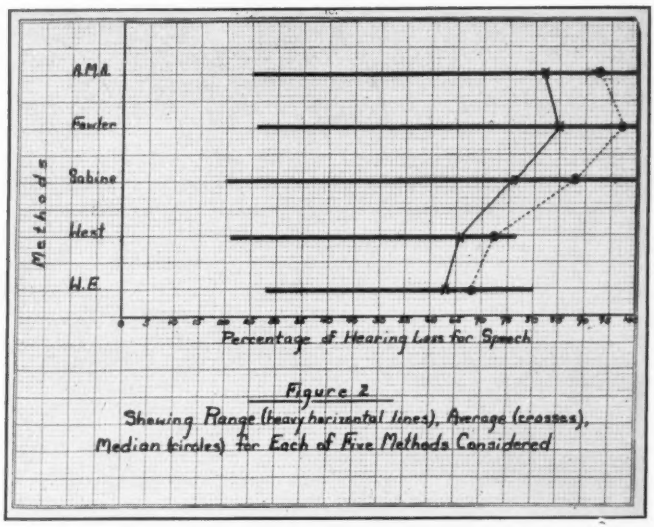

Figure 2

Showing Range (heavy horizontal lines), Average (crosses), Median (circles) for Each of Five Methods Considered

After computing percentages of hearing loss for speech according to each of the five methods previously named, the range, the average and the median were obtained for each method. Figure 2 summarizes the findings. The Sabine method yielded the greatest range of percentages, with the American Medical Association and Fowler methods showing intermediate ranges, while the Western Electric and West methods have the most limited ranges. According to all methods the majority of the cases herein considered possess severe percentage losses. The Fowler method gives the most pronounced losses, and the Western Electric method the least, in proportion to the total range. Furthermore, it is apparent from Figure 2, that the experimental

group did not represent a normal statistical distribution. For all methods both the mean and the median are displaced toward the high loss end of the distribution, with the median nearer the end than the mode.

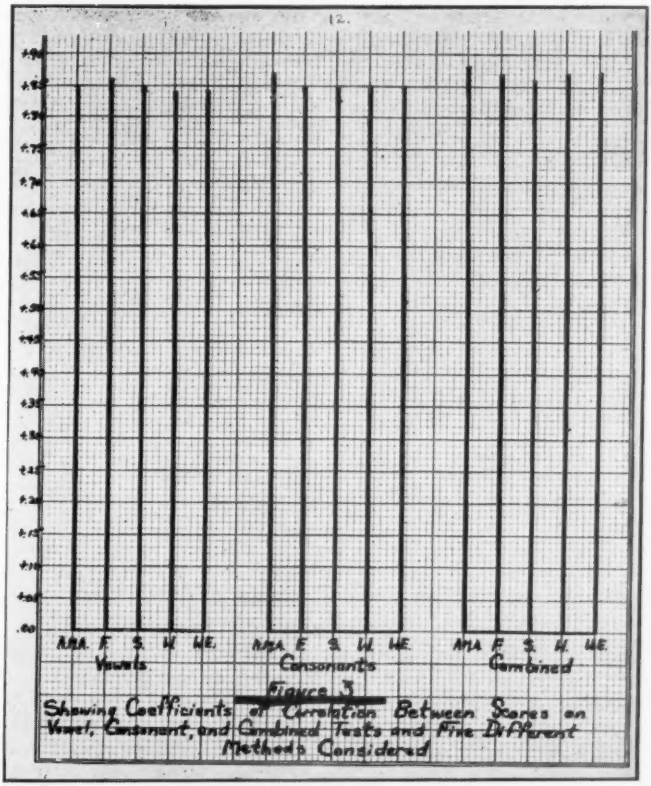

Figure 3

Showing Coefficients of Correlation Between Scores on Vowel, Consonant, and Combined Tests and Five Different Methods Considered

The percentages of loss according to the five different methods were respectively correlated with the vowel test scores, consonant test scores and combined scores. Figure 3 and Table II show the results of these statistical comparisons which were based on the rank differences. For all methods there is a high positive correlation between percentage of loss and discrimination scores. The most surprising thing is the limited range of these correlations—from .85 to .88. The combined test scores yielded the highest correlation in the case of each method. The Sabine method gave

the same correlation for the vowel test as for the consonant test scores. The American Medical Association, West, and Western Electric methods show higher relationships to consonant test scores than to vowel, while the Fowler method shows the opposite trend. Since the range of correlations is so limited, however, these slight differences are practically negligible. The most important observation emerging from these data is that for the hard of hearing children studied the correlations found between percentage of hearing loss, computed according to any one of the five methods, and the discrimination scores are high, positive, and almost identical. There emerged no statistically significant difference

TABLE II. COEFFICIENTS OF CORRELATION BETWEEN DISCRIMINATION SCORES ON VOWEL, CONSONANT AND COMBINED TESTS AND FIVE DIFFERENT METHODS OF COMPUTING PERCENTAGE OF HEARING LOSS.

Comparisons	*Coefficient of Correlation*
A. M. A. and Vowel Scores	.85±.039
A. M. A. and Consonant Scores	.87±.034
A. M. A. and Combined Scores	.88±.032
Fowler and Vowel Scores	.86±.037
Fowler and Consonant Scores	.85±.039
Fowler and Combined Scores	.87±.034
Sabine and Vowel Scores	.85±.039
Sabine and Consonant Scores	.85±.039
Sabine and Combined Scores	.86±.037
West and Vowel Scores	.84±.042
West and Consonant Scores	.85±.039
West and Combined Scores	.87±.042
Western Electric and Vowel Scores	.84±.042
Western Electric and Consonant Scores	.85±.039
Western Electric and Combined Scores	.87±.034

favoring the choice of one method over the others. To be sure the numerical percentages yielded by the various methods are not identical for any individual subject; yet, subjects are grouped in approximately the same sequence for all methods—and this grouping parallels rather closely that yielded by the discrimination scores. Each subject's percentage of hearing loss computed according to any of the methods fits into the total group at approximately the same point in total distribution. All five methods appear to be about equally predictive regarding discrimination of speech sounds. Furthermore, the high positive correlations raise the presumption that—for subjects of the types employed here—the methods and manners of treating the threshold audiogram are highly predictive regarding speech sound discrimination. What is needed now is further study utilizing other subjects with other degrees and types of hearing loss.

Correlations among Various Percentage of Hearing Loss Scores

The high positive relationships just reported led to a further step in the statistical analysis of the data. Correlations between the percentages of loss assigned to the subjects by the various methods were computed on the basis of rank differences. Table III shows the results of these comparisons.

Unusually high positive correlations ranging between .95 and .99 were found. These results offer further evidence that all five methods allocated subjects within the total group in very similar sequences. In this regard, there is no basis for favoring one method. Of course, this conclusion can not be given general application unless confirmed by other investigations. Recognizing the limitations imposed by the special type of subject on which the conclusion is based, it is nevertheless a provocative finding.

TABLE III. COEFFICIENTS OF CORRELATION BETWEEN PERCENTAGES OF HEARING LOSS ASSIGNED TO SUBJECTS ACCORDING TO FIVE STANDARD METHODS FOR COMPUTING LOSS.

Comparisons	*Coefficient of Correlation*
Western Electric and Fowler	.99±.003
A. M. A. and Western Electric	.98±.006
A. M. A. and Sabine	.98±.006
Western Electric and Sabine	.98±.006
Fowler and West	.98±.006
Western Electric and West	.97±.008
A. M. A. and Fowler	.96±.011
A. M. A. and West	.96±.011
Sabine and Fowler	.96±.011
Sabine and West	.95±.014

Correlations Involving Age and Intelligence

Looking back on the results which have been reported one is impressed by the preponderance of high positive correlations. This trend is so pronounced one may question whether selective factors biased the results. The two most probable factors are age and intelligence. The correlation between these two factors and sound discrimination scores were therefore computed.

This group ranged in age from 9 years, 2 months to 24 years, 2 months at the time of the test. Analysis of the relationships between discrimination scores and age provided correlations of −.18 for vowels; −.20 for consonants; and −.23 for combined scores. Since these correlations are relatively low, even though they are negative, age seems to be of little consequence in relation to speech discrimination ability of the subjects under consideration.

Intelligence quotients obtained from the Chicago Non-Verbal Test, for which directions are given in pantomime, were also used. The I. Q. range of the group was from 68 to 142. Analysis of relationships between test scores and I. Q. provided correlations of .23 for vowels; —.04 for consonants; and .15 for combined scores. Again, since all relationships are so low, I. Q. seems to be of little consequence in relation to the speech discrimination ability of the group under consideration. Furthermore, when age and I. Q. were correlated, the result was .11, which is also too small to be of statistical value.

IV. SUMMARY AND CONCLUSIONS

Pure tone audiometric tests were given to 51 markedly hard of hearing children. Tests were also administered to this group

to determine vowel and consonant discrimination ability. All discrimination tests were given through a group hearing aid with monaural phones.

Auditory acuity at octave intervals from 128 through 2048 was considered in relationship to scores on the discrimination tests. The subjects' percentages of hearing loss were determined according to five standard methods. The range, the average and the median of the percentage losses were computed for each method. Coefficients of correlation were found between consonant and vowel test scores; between loss at individual frequencies and discrimination scores; and between percentage of loss as computed by each method and sound discrimination. Finally, the various percentage loss methods were correlated with one another.

In order to check for the possibility of the influence of additional factors, both chronological age and intelligence quotient were related to sound discrimination scores. The correlation between C. A. and I. Q. was also checked.

The following conclusions were reached:

1. Errors on the vowel test and errors on the consonant test show a high positive correlation (.84).
2. Age seems to be of little consequence in relation to speech discrimination ability as measured by these tests.
3. I. Q., likewise, has no particular relationship to speech discrimination ability as measured by these tests.
4. Age and I. Q. show no significant inter-relationship in the subjects studied.
5. There was a general tendency for the correlation between losses at specific frequencies and sound discrimination to increase with rise in frequency.
6. When 128, 256, 512, 1024 and 2048 cycles are considered, losses at 1024 and 2048 show the highest relationships to error scores on the vowel test (.84 and .81).
7. Losses at 512, 1024 and 2048 cycles are about equally correlated with errors in consonant discrimination (.83, .82, .83).
8. Residual hearing at 1024 cycles was approximately of equal importance to that at 2048 when evaluated on the basis of discrimination of vowels and consonants (.84 and .82; .81 and .83).
9. When five different methods of determining percentage of hearing loss for speech (American Medical Association, Fowler, Sabine, Western Electric, and West) are employed, the Sabine method shows the largest range in percentage scores assigned to subjects (80%) and the Western Electric method shows the smallest (52%).
10. All methods show the majority of the experimental group to possess severe losses in terms of percentage of hearing loss for speech.
11. When subjects' losses were estimated by any one of the

five methods there was high positive correlation between the percentages assigned and error scores on the speech discrimination tests. Furthermore, the correlations for all methods were very similar, ranging from .85 to .88.

12. Correlations ranging from .95 to .99 were found when percentage of hearing loss scores computed by the five different methods were considered.

13. The high correlations among methods for computing percentage of hearing loss and the high correlations between loss as computed by any method and scores on the speech discrimination test suggest that methods of computing percentage of loss may be more predictive of residual auditory discrimination than is often supposed. This conclusion can only be drawn tentatively from the present study since not all degrees and types of loss were sampled. Furthermore, the present study did not yield information as to which method of computing percentage loss comes closest to representing the actual amount of handicap. One can only say at present that the different methods investigated ranked the subjects in similar sequences. The absolute accuracy of different methods has yet to be determined.

14. The results mentioned above were somewhat unexpected in view of strong doubt expressed by some authorities as to the educational and research usefulness of the percentage loss concept. The present study has shown positive relationships between percentage loss and discrimination for speech sounds to exist in children with extreme hearing losses. There is clearly need for an extension of this study to include both subjects of other types, and tests utilizing connected speech. Full and varied experimental investigation should clarify the concept of percentage loss and make possible more effective use of this concept in estimating effective residual hearing.

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THE PURE TONE SCREEN TEST OF HEARING

GORDON E. PETERSON, Ph.D.
Northwestern University

This paper reports a technique developed for the administration of the pure tone screen test of hearing, often called the sweep check method, in the public schools, and includes the results of the technique as administered in testing 3,393 cases. The work was done in the public schools of Indiana during the school year 1942-1943 in conjunction with the Hearing Test Service of Ball State Teachers College.

I. Procedure

Technique: The administration of the pure tone screen test, just as the administration of any other type of audiometric screen test, requires a well planned procedure.

a. Preliminary arrangements: An instruction sheet describing preliminary arrangements was sent to each school in advance of the test. Copies of the Pure Tone Screen Test form given in Chart 1 were also sent at this time. Duplicate copies of the names of the students to be tested were prepared on these forms in advance of the test.

b. Room: The maintenance of quiet testing conditions is the major problem in all audiometric testing in the public schools, and quiet is the factor requiring major consideration in the choice of room. It should usually be a top-floor corner room, away from playground, traffic and other outside noises. The room should also be as far removed as possible from all sources of building noise, such as hallways, drinking fountains and motors. Where possible, any noise which interferes with the test must be eliminated while testing is in progress. If techniques of masking during the administration of audiometric tests can eventually be developed which will materially reduce the noise problem, public school testing will become much more practical. A small room is adequate for this test. It must have an alternating current outlet.

c. Equipment: A table or desk and approximately ten chairs are required.

d. Audiometer: Both the Western Electric 6B and the Maico 5D were used extensively in the testing. Once the operator becomes familiar with the dials on the 6B there is no difference in the time involved in the use of these two machines, both of which are accepted by the Council on Physical Therapy of the American Medical Association. The limiting time factor is the response of the child being tested.

e. Explanation: A brief explanation of the test and its purpose was always given to each room or assembly before the test was administered to the group. It is advisable to drill primary children briefly on the signal to be employed in the test.

f. Assistants: Three student assistants were employed. One sat beside the examiner and recorded, at his direction, each frequency failed on the test. A second assistant held a Newhart masking device over the ear not tested and also made certain that the earphone was placed properly. A third assistant went for the students, sent them into the testing room at the proper time, and maintained quiet in the halls.

g. Testing procedure: Three students were kept in the room at all times. While one took the test two others watched, so that each student had an opportunity to see two take the test before his own examination. The hand or finger signal was employed. The order of frequencies was from low to high, with some frequencies repeated in each ear as a check, and with considerable variation in the rate of presentation of the tones. Often it was necessary to present the first two or three tones at a greater intensity and then to reduce

the level to 20 db. which was the standard for the test. The tone interrupter was always employed during a change in the intensity of the tone.

h. Retests: Students who failed the first test were later brought back for a second pure tone screen test. If they failed this test they returned still later for a pure tone audiogram. In several instances the loss occurred in only one ear. If the other ear could pass a pure tone screen test at 15db. a complete audiogram was made only for the defective ear. Otherwise a complete audiogram was made for each ear.

i. The forms listed below were employed in the administration of the Hearing Test Service and in the reporting of defective cases:

1. Instruction Sheet (for the Principal).
2. Pure Tone Screen Test (as shown in Chart 1).
3. Audiogram (as shown in Chart 2).
4. History (prepared by the parents in advance for children in the first three grades; completed by all older students with defective hearing).
5. Recommendations for Parents (for the parents of hard of hearing students).
6. Helping the Hard of Hearing in the School Room (for the teachers).
7. Hearing Health (for all parents).
8. Facts about Hearing (for teachers).
9. Bibliography (for the school).

II. Results

Data: The following analysis is based on 3,393 cases, less than half of the total number of children tested by the pure tone screen technique during the year. The schools chosen for the analysis were those in which testing conditions had been fairly satisfactory and for which complete data were available to the author. The

TABLE I. The Number of Cases Passing and Failing the First and Second Pure Tone Screen Tests.

Pure tone screen test at 20 db.	No. Cases	Percentage of 3,393
1. Number tested	3,393	100
2. Failed first screen test in one or both ears	738	21.75
3. Failed first screen test and not given a retest	167	4.92
4. Failed first screen test and given a retest	571	16.83
5. Passed the second pure tone screen test	277	8.16
6. Failed the second pure tone screen test	294	8.66

test was administered at 20 db. above normal threshold on all frequencies tested. The frequencies employed were 128, 256, 512, 1024, 2048, 4096, and 8192. As established by the administrators of the four Hearing Tests Services from the four institutions of higher learning in the state,[1] a failure on two or more frequencies in the same ear constituted a failure on the screen test. A total of 738 cases, or 21.75 per cent failed the first test. Though it is commonly known that losses of only 10 or 15 db. may be medically significant, adequate medical attention for such cases is particularly difficult to obtain. To make pure tone audiograms for all children showing a loss of 10 db. or greater on two or more frequencies in the same ear would limit the rate of testing to less than 50 children per day.

[1] Indiana University, Indiana State Teachers College, Purdue University, and Ball State Teachers College.

CHART 1.—Pure Tone Screen Test Form Used in the Testing Program.

Pure Tone Screen Test

Date..... Number Tested.....
County..... Pure Tone Screen Retests.....
School..... Pure Tone Audiograms.....
Grade..... Audiometer.....
Teacher..... Examiner.....

On these forms please make two copies of the names of the students to be tested. Place the names in alphabetical order with the last name first. When more than one grade is included, arrange the names by grades, with the upper grades first.

NAME	128 R	256 R	512 R	1024 R	2048 R	4096 R	5792 R	8192 R	128 L	256 L	512 L	1024 L	2048 L	4096 L	5792 L	8192 L	Normal Hearing	Not Tested	Retest	Normal on Retest
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
7.																				
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Check marks in the columns for the right and left ears indicate that the student failed the respective frequencies on the first pure tone screen test. That a hearing loss does exist, however, can only be shown on the pure tone audiogram which is made for as many as possible of those failing the pure tone screen retest.

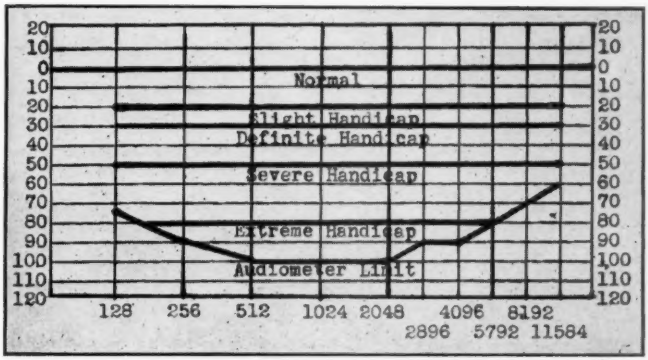
CHART 2. Audiogram and Forms for Reporting Interpretations and Recommendations.

Audiogram

Name_____ Date_____

Age_____Grade_____ School_____

Teacher_____ County_____



Key: Right . . . red—X. Left . . . blue—0.

Interpretation:

1. At the time of the test the hearing in the right ear was within the normal range on a pure tone screen test at 15 db. in the low and middle and high frequency range.
2. At the time of the test the hearing in the left ear was within the normal range on a pure tone screen test at 15 db. in the low and middle and high frequency range.
3. At the time of the test the hearing was adequate for the normal comprehension of speech, both in conversation and in group situations such as in the classroom.
4. At the time of the test the hearing was sufficient to make possible a fairly normal comprehension of conversational speech, but some difficulty should occur in group situations such as in the classroom.
5. At the time of the test the hearing of speech in conversational situations was slightly, considerably, severely, extremely impaired; the hearing would be still more seriously impaired in group situations such as in the classroom.
6. Because of the difference in the hearing in the two ears the hearing handicap varies with the position of the speaker from:

normal		normal
slight		slight
considerable	to	considerable
severe		severe
extreme		extreme

Recommendations:

1. .....An immediate medical examination for the hearing.
2. .....A medical examination if buzzing, earache, or running ear again develops.
3. .....Continued medical treatment.
4. .....An additional medical examination for the hearing.
5. .....Observe the rules for good hearing health carefully.
6. .....Until the hearing is improved seat near the front of the classroom, if possible on the right, on the left, on either side.
7. .....Lip reading instruction if the hearing cannot be improved.
8. .....A hearing aid if the hearing cannot be improved.
9. .....Speech correction.
10. .....Retest in.....months.

Examiner.....

Of the 3,393 children tested, 8.66 per cent failed the second pure tone screen test. This is slightly more than half of the number of children receiving a second test. As approximately 5 per cent of the children who failed the first pure tone screen test

TABLE II. THE NUMBER OF CASES WITH LOSSES GREATER THAN 20 DB., AND WITH LOSSES GREATER THAN 30 DB., IN ONE OR BOTH EARS AS SHOWN BY THE AUDIOGRAM.

Loss on two or more frequencies in the same ear as shown by the audiogram	No. Cases	Percentage of 3,393
1. 20 db. or greater in one or both ears	294	8.66
2. 30 db. or greater in one or both ears	145	4.27
3. 20 db. or greater in both ears	164	4.83
4. 30 db. or greater in both ears	78	2.30
5. 20 db. or greater on 4096 and 8192 only in one or both ears	28	0.83

were not given a second test, it may be assumed that over 10 per cent of the children tested had losses of 20db. or greater on two or more frequencies in the same ear. It is evident that had the test been administered at 10db. a very high percentage of the children would have shown some degree of hearing loss.

TABLE III. THE DISTRIBUTION OF HEARING LOSS AS SHOWN BY AN ANALYSIS OF THE AUDIOGRAMS.

Loss on two or more frequencies	One ear only	Loss in both ears in the same class	Both ears defective, with a greater loss in the other ear[1]
1. 20 db. or greater, but not greater than 30 db.	63	33	53
2. 30 db. or greater, but not greater than 50 db.	47	34	35
3. 50 db. or greater, but not greater than 80 db.	17	4	4
4. 80 db. or greater	3	1	

[1] Thus 53 of the children for whom pure tone audiograms were made had a loss on two or more frequencies of 20 db. or greater, but not greater than 30 db., in one ear, and a still greater loss on two or more frequencies in the other ear.

Table II shows that only 28 of the 3,393 children tested had losses greater than 20 db. on the frequencies of 4096 and 8192 only. (Of the 3,393 children tested, 0.83 per cent is notable, but not particularly high.) On the first pure tone screen test many children did fail one of these two frequencies, however, in either one or both ears.

TABLE IV. THE AUTHOR'S JUDGMENT OF THE DEGREE OF HEARING LOSS FOR SPEECH FROM AN INDIVIDUAL EXAMINATION OF EACH AUDIOGRAM.

Hearing impairment	One ear only	Both ears in the same class	Both ears defective, with a greater loss in the other ear[1]
Slight	51	28	31
Definite	21	11	8
Severe	5	5	1
Extreme	4		

[1] See footnote to Table III.

Table III was prepared to indicate the extent of db. loss. Table IV presents a subjective judgment of the hearing loss for speech from an examination of each audiogram. The total number judged to have slight or greater hearing impairment for the comprehension of speech in one or both ears was 165, or 4.86 per cent of the 3,393 cases. Eighty-four, or 2.48 per cent, were judged to have slight or greater hearing impairment for the comprehension of speech in both ears, and 25, or 0.74 per cent, were judged to have definite or greater hearing impairment for the comprehension of speech in both ears.

III. COMMENT

With this technique, retesting the percentages of children indicated in the preceding pages, the author was able to complete all necessary tests on approximately 100 students per day. The person with only limited experience in pure tone screen testing is likely to consider it a very tiresome process. The author did not find it so. The entire procedure very soon becomes mechanical, and if the height of the instrument is properly adjusted there is no more cause for fatigue with this method than there is with any other type of audiometry, perhaps even less. Usually students who learn to operate the pure tone audiometer well can rather quickly learn to obtain reliable results in pure tone screen testing.

There has been considerable discussion of the comparative values of the pure tone screen and the group phonograph methods of testing. Both procedures have been used extensively, and a study comparing the two methods should be highly profitable. Such a study should involve an examination of cases on the same day by both methods, with pure tone audiograms made for all students failing the second test with either method.

In such a study one of the major considerations must be the scoring of group papers. Methods of scoring at present vary considerably and there is definite question as to whether the same cases are selected for retest by different methods of scoring. If a method of scoring is eventually standardized by experimental methods, then an adequate comparison of the two techniques should be possible.

IV. Summary

This study is the report of a technique developed for the administration of the pure tone screen test of hearing, and includes the results of the test administered to 3,393 children. Of these children 738, or 21.75 per cent, failed the first test. Retests were given to 571, or 16.83 per cent, and of these children 294, or 8.66 per cent of the 3,393, failed the second test. The pure tone audiogram showed that 130 of these children had a loss of 20 db. or greater on two or more frequencies in one ear only and that 164 had such losses in both ears. According to the author's judgment of the audiograms 84, or 2.48 per cent of the 3,393 children, had slight or greater hearing impairment for the comprehension of speech in both ears.

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THE RELATIONSHIP OF EAR PREFERENCE TO OTHER LATERALITY CHARACTERISTICS

CLAUDINE MOUNSEY, B.S.
Muncie, Indiana
GORDON E. PETERSON, Ph.D.
Northwestern University

I.

This paper reports an examination of the relationship of ear preference to choice of eye, hand and foot on certain laterality tests.

Ear Preference: The apparatus for determining ear preference consisted of an earphone, mounted on a stand, and placed on the output of a beat frequency oscillator. The subjects stood squarely in front of the earphone, and the intensity control on the oscillator was gradually increased. Ear preference was indicated by the ear which each subject placed nearer the phone while listening for the tone. Three trials were used to determine the ear preference of each subject. Subjects inclining the right ear toward the earphone on all three trials were considered right eared and were designated with an R; subjects using the left ear on all three trials were considered left eared and were indicated with an L. All subjects who made an inconsistent ear choice, or who leaned forward without inclining either ear toward the earphone were considered inconsistent and were designated by I.

Hand Preference: Four tests were used to determine the preferred hand. (1) A fountain pen was handed to the subject and he was asked to remove the top and then to replace it. The hand employed in turning the pen was considered the preferred hand. When both hands turned, or when first one hand and then the other was used, the subject was considered inconsistent. (2) The subjects were asked to write numbers from dictation at a blackboard simultaneously with both hands. If one hand consistently reversed, the other hand was considered dominant. Otherwise the subject was considered inconsistent in handedness. (3) Paper was mounted on two opposite sides of a box and the subject was asked to write numbers from dictation simultaneously with both hands. The hand giving the correct pattern was considered the dominant hand, and the hand giving the mirrored pattern was considered the non-dominant hand. (4) With paper mounted on the two opposite sides of the box, subjects were asked to copy simultaneously with both hands a pattern held before them. When both hands mirrored alternately, the subject was considered inconsistent in handedness. Subjects showing a definite right hand preference on at least three of the four handedness tests used were considered right handed. Those showing a definite left hand preference on at least three of the four tests were considered left handed. All other subjects were considered inconsistent.

Eye Preference: Three tests were used to determine eye preference. (1) Subjects were asked to sight with a pencil at the nose of the examiner. (2) Subjects stood fairly close to the examiner and sighted through a funnel at her nose. In all cases where glasses were worn, both sighting tests were taken with and without glasses. When the results with and without glasses differed on either test, the subject was eliminated. This occurred in seven cases. (3) The convergence test, in which an object is slowly moved in between the eyes of the subject, was used. The eye which was fixated on the object longer as it was brought close to the face was considered the dominant eye. Subjects preferring the right eye on all three tests were considered right eyed, and those using the left

eye on all three tests were considered left eyed. Subjects showing one inconsistent eye choice were considered inconsistent.

Foot Preference: Four tests were used in the examination for the preferred foot. (1) The subject was asked to step upon a box and then to step down. The leading foot was considered the preferred foot. (2) Subjects were asked to kick a ball so that it would roll directly into a corner of the room. The foot used for the kick was considered the preferred foot. (3) Subjects were asked to fall forward and to catch themselves with one foot by suddenly stepping forward. The foot used was considered the preferred foot. (4) Subjects were asked to start to get upon a table by placing one knee on the table top. The knee placed on the table was considered to indicate the preferred foot. Subjects using the right foot in three of the four tests were considered to prefer the right foot. Those using the left foot in three of the four tests were considered to prefer the left foot. Subjects making two inconsistent trials were considered inconsistent.

II.

Table I shows the data for preferred ear, hand, eye, and foot for the 45 subjects.

TABLE I. EAR, HAND, EYE, AND FOOT PREFERENCE FOR EACH OF THE 45 SUBJECTS. R=RIGHT, L=LEFT, I=INCONSISTENT.

Subject Number	Ear	Hand	Eye	Foot	Subject Number	Ear	Hand	Eye	Foot
1	R	R	R	I	24	L	R	R	R
2	I	R	R	R	25	L	R	R	I
3	R	R	I	R	26	I	I	R	I
4	R	I	I	R	27	R	R	I	R
5	R	I	R	R	28	R	R	I	R
6	R	R	I	I	29	I	R	R	R
7	R	I	L	R	30	L	R	I	R
8	R	I	R	R	31	R	I	R	R
9	R	R	R	I	32	L	R	I	I
10	R	R	R	R	33	I	R	L	I
11	I	I	R	L	34	R	R	R	R
12	I	R	R	I	35	R	R	L	R
13	L	R	I	R	36	R	R	R	R
14	I	R	L	I	37	L	R	R	I
15	I	I	R	I	38	L	R	I	R
16	R	I	R	I	39	R	R	I	R
17	L	R	L	I	40	I	R	R	I
18	R	I	I	I	41	I	R	I	R
19	R	R	I	R	42	R	R	R	R
20	L	I	I	I	43	R	R	R	I
21	R	R	I	R	44	R	R	R	R
22	R	I	L	R	45	R	R	I	R
23	L	R	R	R					

Seventeen, or 37.8 per cent, of the subjects preferred the same ear and the same hand on the tests used. Three subjects were inconsistent in ear preference and also in hand preference. Sixteen subjects were consistent in one of the characteristics but inconsistent in the other. Only nine subjects consistently preferred the opposite ear and hand.

Thirteen, or 28.9 per cent, of the subjects preferred the same ear and the same eye on the tests used. One subject was

inconsistent in ear preference and also in eye preference. Twenty-four subjects were consistent in one of the characteristics but inconsistent in the other. Only 7 subjects consistently preferred the opposite ear and eye.

Nineteen, or 42.2 per cent, of the subjects preferred the same ear and the same foot on the tests used. Six subjects were inconsistent in ear preference and also in choice of foot. Fifteen subjects were consistent in one characteristic but inconsistent in the other. Only 4 subjects consistently preferred the opposite ear and foot.

These data indicate that there is some positive relationship between ear preference and the other laterality characteristics examined in this study, although the data do not indicate that this relationship is particularly close.

THE RELATION BETWEEN EAR PREFERENCE AND HEARING ACUITY

E. W. BILTO, B.S.
Wayne University
GORDON E. PETERSON, Ph.D
Northwestern University

I.

This is a preliminary study to determine whether ear preference is closely related to auditory acuity. Pure tone audiograms were made of 69 subjects at the following frequencies: 128, 256, 512, 1024, 2048, 4096, and 8192. The apparatus for determining ear preference consisted of an earphone, mounted on a stand, and placed on the output of a beat frequency oscillator. The subjects stood squarely in front of the earphone, and the intensity control on the oscillator was gradually increased. Ear preference was determined by the ear which each subject placed nearer the phone while listening for the tone.

At the outset two limitations to such a study involving auditory acuity must be recognized. The rather considerable variation in hearing acuity found in most cases of hearing loss is well known. Moreover, identical points on subsequent tests of persons with normal hearing often cannot be established. so that the audiograms used in this study are not records of the permanent hearing acuity of the respective subjects. Secondly, if comparative hearing acuity is a major determining factor in ear preference, hearing acuity from infancy on should be considered, rather than the present acuity alone.

The fact that the acuity curves of the two ears do not normally maintain a close relationship to each other, and thus may cross frequently, further complicates analysis. In this

study the db. difference between the curves for the two ears was determined for each frequency tested. When the right ear was superior the difference was considered positive, and when the left ear was superior the difference was considered negative. The following factors were then studied in relation to ear preference:

1. The differences in acuity at the various frequencies between the two ears were added and averaged for each subject. An analysis was then made of the relationship between these average acuity scores and ear preference.

2. There were several cases in which one ear was appreciably superior to the other, as indicated by the average acuity difference scores. An analysis of these cases was made to determine the relationship between ear preference and a relatively pronounced acuity difference.

3. In some cases one ear was *consistently* superior to the other. If one ear was equal in acuity to the other at two or fewer frequencies and was superior for all the rest, that ear was considered consistently superior. Thirteen of the 69 cases met this requirement, and for all these cases the relationship of the ear consistently superior in acuity to ear preference was determined.

4. In order to determine whether a large difference in hearing acuity within a limited frequency range may be a significant factor, a study was made of the ear preference of subjects with a difference in acuity between the two ears of 20 db. or greater on either one or two frequencies.

Three trials in listening to the earphone were used to determine the ear preference of each subject. Subjects inclining the right ear toward the earphone on all three trials were considered right eared and were designated with an R; subjects using the left ear on all three trials were considered left eared and were indicated with an L. All other subjects were considered to lack a consistent ear preference and were designated by I (inconsistent).

II.

Tables I, II, and III summarize the data.

TABLE I. THE NUMBER OF CASES HAVING THE RIGHT EAR, THE LEFT EAR AND NEITHER EAR SUPERIOR IN ACUITY FOR EACH OF THE THREE EAR PREFERENCE GROUPS.

		Ear Superior in Acuity		
Ear Preferred	*N*	*Right*	*Left*	*Neither*
Right	39	19	17	3
Left	13	5	6	2
Inconsistent	17	5	9	3
Totals	69	29	32	8

The findings may be summarized as follows:

1. Of the 69 cases examined, 39 were right eared, 13 were left eared and 17 were inconsistent.

2. Of the 39 cases with a right ear preference, 48.7 per cent had superior right ear acuity scores, and 43 per cent of the 39 cases had superior left ear acuity scores. Of the 13 cases showing a left ear preference, five had superior acuity in the right and six in the left ear. These data indicate that for a group of unselected subjects there is no significant relationship

between ear preference and the difference in auditory acuity between the two ears.

TABLE II. EAR PREFERENCE FOR CASES WITH RELATIVELY LARGE ACUITY DIFFERENCES BETWEEN THE TWO EARS, AS INDICATED BY SCORES GREATER THAN 5 AND LESS THAN —5, AND GREATER THAN 10 AND LESS THAN —10. POSITIVE SCORES REPRESENT RIGHT EAR SUPERIORITY AND NEGATIVE SCORES INDICATE LEFT EAR SUPERIORITY IN ACUITY.

Ear Superior	*Difference Score*	*Average of Scores*	*Ear Preferred*			
			R	*L*	*I*	*N*
Right	Greater than 5	9.4	4	1	2	7
Left	Less than —5	—11.6	4	5	1	10
Right	Greater than 10	14.5	1	0	1	2
Left	Less than —10	—28.0	1	1	0	2

3. There is some indication, however, that a left ear preference may occur more frequently in cases where the left ear is definitely superior to the right. Of the cases with scores greater than 5, four were considered right eared and one was left eared. Of the cases with scores less than —5 (better acuity in left ear), four were considered right eared and five were left eared. A similar tendency was indicated by an analysis made of cases with the acuity of one ear equal to that of the other ear on two or less individual frequencies and superior to that of the other ear on all remaining frequencies. In all there were 13 cases in this group. Of the cases receiving positive scores (better acuity in right ear), four were right eared and one was left eared. Of the cases receiving negative scores, four were right eared but three were left eared. Moreover, the only hard of hearing case included in the group had a relatively normal left ear, but a very defective right ear. On the ear preference test he consistently chose the left ear.

TABLE III. EAR PREFERENCE FOR CASES WITH THE RIGHT EAR CONSISTENTLY SUPERIOR, WITH THE LEFT EAR CONSISTENTLY SUPERIOR, AND FOR CASES WITH AN ACUITY DIFFERENCE OF 20 DB. OR GREATER ON EITHER ONE OR TWO FREQUENCIES.

	Average of Scores	*Ear Preferred*			
		R	*L*	*I*	*N*
Ear Consistently Superior					
Right	5.2	4	1	0	5
Left	—13.0	4	3	1	8
Ear Superior in Acuity by 20 db. or More on either 1 or 2 Frequencies					
Right		5	3	2	10
Left		1	1	1	3

4. A fairly large percentage of the subjects showed a right ear preference, while a much smaller percentage showed a left ear preference. It is well known, however, that in a large group of unselected subjects there is little difference in the acuity of the two ears. Thus, a more general consideration indicates that the difference in hearing acuity between the two ears would not usually be a primary factor in determining ear preference.

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AUDITORY ACUITY AND ITS RELATION TO DEFECTIVE SPEECH

E. MARGARET SULLIVAN, B.S.
Minneapolis Public Schools

I. INTRODUCTION

The Minneapolis teachers of speech correction, while reviewing recent research in the preparation of a handbook for use in the department, found disagreement among investigators on the question of the relationship of auditory acuity to defective speech.

Ansberry (1) found that persons familiar with English speaking sounds are not handicapped in understanding or discriminating between speech sounds when frequencies above 4,000 cycles are eliminated. Barnes (2) found no relationship between hearing loss, as measured on the Western 4A Audiometer, and articulation rating in a university freshman class. Hall (5) concluded from her study, "It would seem evident that deficiency in auditory acuity, either for the entire frequency range or for high frequencies only, is not a differentiating factor between normal and defective speakers, and consequently should be abandoned as a generalized explanation of functional articulatory defectiveness." Stinchfield (7) reported no significant difference between normal and defective speakers on the Seashore measures of pitch intensity and tonal memory.

Contrary evidence has been reported by other workers, however. Carrell (3) has stated, "A high percentage of the sound substitutions may be explained on the basis of acoustic properties which make them difficult to perceive and discriminate; those involving the sounds *v, th, b, p, f, d,* and *t.* These sounds are, in general, perceived more accurately by normal speakers. Those substitutions involving *r, w, s,* cannot, on the basis of data given here, be attributed to acoustic factors." Travis and Rasmus (9) found the ability to discriminate speech sounds to be a significant factor in differentiating speech defectives from normal speakers. (While this is not the same as acuity of hearing, neverthless Carrell found a high correlation between auditory acuity and phonetic discrimination.) Travis and Davis (8) found a difference in favor of good speakers as compared to defective speakers on the same Seashore tests as were used by Stinchfield (7). Harms and Malone (6) found evidence to suggest that loss of hearing acuity during the period of speech formation is a cause of stammering. Gaines (4) found cleft palate cases to have greater hearing losses than cases with functional articulatory defects.

II. PROCEDURE AND SUBJECTS

The Hygiene Department of the Minneapolis Public Schools has in the past three years given individual audiometer tests to 25,708 elementary school children. The teachers of speech correction decided it would be of interest and perhaps of value to use these data in an effort to determine whether speech defectives in our schools are inferior in auditory acuity to the children in our general school population.

The Maico D6 audiometer, which is a pure tone instrument, was used. Two specially trained school nurses administered all the tests. Diminution of ten decibels from the normal sensitivity of the hearing organ was considered a hearing loss. Losses of hearing in the frequencies 4,000 cycles or above were

considered high frequency losses, and those below 4,000 cycles were considered low frequency losses. During the years 1939 to 1942, the percentage of children with a significant hearing loss, as defined above, in one or both ears varied from 20.5 per cent to 17.5 per cent.

Audiometer test results were recorded for 1,501 children who had been in the speech correction classes at some time during the three-year period. These 1,501 speech defectives were classified as stutterers, stutterers having articulatory defects, articulatory defectives and paralytic cases. Only sound substitutions and omissions were considered articulatory defects. For more intensive study, the articulation cases were separated into those involving functional and structural defects, respectively, and the errors were classified as errors involving sibilants, those involving other sounds, and oral inactivities. Losses in high frequencies only and in low frequencies were tabulated separately. Those pupils with losses in both high and low frequencies were tabulated in the low frequency category because low frequency loss was given precedence over high frequency loss.

III. Results

The data are summarized in Table I.

TABLE I. Percentages of 25,708 Minneapolis School Children Showing a Hearing Loss*

Groups Tested	Number	Percentage Showing Hearing Loss	High Frequency Loss Only	Low Frequency Loss
General School Population	25,708	19.0	13.2	5.8
Year 1939-40	9,849	20.5	13.7	6.8
Year 1940-41	8,007	18.6	14.4	4.2
Year 1941-42	7,852	17.5	11.2	6.3
General School Population Minus 1501 Speech Defectives	24,207	18.8	12.9	5.9
Speech Defectives	1,501	22.2	13.8	8.4
Stutterers	199	26.2	16.1	10.1
Stutterers with Articulatory Defects	87	25.3	16.0	9.3
Stutterers—Paralytica	5	40.0	40.0	.....
Total Stutterers	291	26.1	16.5	9.6
Articulatory—Functional cases	1,054	20.3	12.6	7.7
Articulatory—Structural cases	138	26.1	15.2	10.9
Total Articulatory cases	1,192	21.0	12.9	8.1
Articulatory—Faulty Sibilants	1,002	21.8	13.2	8.6
Articulatory—Other sounds	221	17.6	11.8	5.8
Articulatory—Oral Inactivity	56	25.0	16.1	8.9
Paralytica—Articulatory	18	44.4	27.7	16.7

* A hearing loss was defined as a dimunition of ten decibels from the normal sensitivity in either ear, as measured by means of the Maico D6 audiometer.

IV. Summary

A slightly higher percentage of the total group of speech defectives used in this study than of the children of the public school population of Minneapolis shows a hearing loss in one or both ears—22.2 per cent as against 18.8 per cent. However, considerably higher percentages of the stutterers, structural articulatory cases, and cases of oral inactivity than of the school population show a hearing loss in one or both ears. Slightly more than twice as high a percentage of paralytic cases than of the school population shows a hearing loss in one or both ears.

A study was made of those articulatory cases having faulty sibilants [s], [z], [dʒ], [ʃ], [ʒ], [ts]. (The [ɣ] and [θ] were not included in this group of high frequency sounds because a large foreign population in the Minneapolis schools makes these sounds primarily a dialectal problem.) Of the articulatory cases with faulty sibilants, 13.2 per cent show a hearing loss in the high frequencies, as compared with 12.9 per cent of the general school population.

V. Conclusions

The higher percentage of stutterers, structural articulatory cases and cases of oral inactivity showing a hearing loss in one or both ears is probably symptomatic of the general physical condition of these pupils and should be considered in therapeutic treatment. The fact that pupils with faulty sibilants, the high frequency sounds, are apparently not differentiated from the general school population on the basis of hearing loss in the high frequencies seems to indicate that hearing loss in the high frequencies is not to be regarded as standing in a significant relationship to their defective speech.

We know that all speech defectives in the general school population were not included in our 1,501 defective speech cases, however, so we have started an analysis of selected groups of speech defectives and non-speech defectives, matched with respect to chronological age, intelligence quotient and sex. The results of this study will be reported in due time.

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TEACHING A DEAF CHILD TO TALK

RUTH BECKEY IRWIN, Ph.D.
Columbus, Ohio

One of the most interesting cases that ever came to the Ohio University Speech Clinic was a little four-year-old girl who could neither talk nor hear anything as far as we could ascertain. She was still too young to be admitted to the local state school for the hard of hearing. The mother had taken the child to an ear specialist several times in order to determine her hearing capacities. However, the doctor was unable to state definitely whether or not the child was deaf.

Not knowing what else to do, the mother brought her daughter to the university speech clinic upon the recommendation of the doctor. Through further testing, the facilities of the speech and psychological clinics were also unable to determine to what extent the child heard. From an attempt with the audiometer, it was believed that the patient had some conduction hearing in the upper frequency levels. It was found also that she noticed whistles, airplane hums and bells, and that [ʃ] and [s] were among the first sounds to be learned.

Since Mary Anne, as we shall call her, presented a severe behavior problem, it was believed that possibly she might have an emotional block which was responsible for her apparent deafness. Consequently, realizing that Mary Anne was too young to enter the special school for the deaf and also realizing that she must have immediate training if she were a delayed speech case with a functional hearing loss, the university speech clinic offered its services.

The child's case history revealed no particular cause for the deafness. She had had two shocks which might have been sufficient to have caused delayed speech in a normal-hearing child. At the age of one and one-half years, she was in an auto accident which caused a bump on the right side of her head. At nineteen months a condition of tongue-tie, which had been present from birth, was surgically corrected. She had had no babbling period. Until the age of three and one-half years she had made no sounds. At this time, she came to the clinic.

According to the psychological tests that were used, Mary Anne showed normal intelligence and normal social maturity.

During the beginning treatments, Mary Anne was quite unmanageable and frequently developed temper tantrums. She was determined to have her own way. She would gesticulate violently to tell her mother that she had better remain in sight or else. Gradually we won the little girl's interest in pictures and toys. Mary Anne soon learned to watch us as we said the words indicating the names of the pictures presented. Her mother reported more babbling and jabbering at home, too.

At the time when Mary Anne first came to the clinic she had no speech at all, not even babbling. Stimulation through the use of pictures was quite successful in starting Mary Anne toward learning the first steps of speech.

Among the first sounds and sound combinations for Mary Anne were *ah,* [o], [b], *bye-bye, ma-ma,* [p] and [f]. The pictures which were used for Mary Anne had easy names. Such pictures as could be named with *pen, pie* and *pipe* were grouped together. *Shoe* and *shirt* were placed in a group. *Fish* and *fork* were put together. *Apple* was her favorite word and was said most distinctly and completely. However, her [p] was more like a [b] than a [p]. Each time she saw a picture of a *shoe,* she would say [ʃ] and point to her own shoe. *Pipe* was indicated by two puffs at the appropriate end of the pipe. The clinician felt that it was desirable for the child to associate at least one sound with a word. *Fish* was always indicated by an [f]. Of course, the sounds which were easily seen on the clinician's mouth were the first to be learned.

Since a deaf child cannot learn to do much talking until she reads, an early attempt was made to help the child to differentiate between the printed symbols of the sounds. Small flash cards were used. The following symbols were printed on them: *ah, o, sh, b, p, f, m.* These were quickly learned and distinguished. In less than three months' time she learned how to identify twenty-five pictures of objects with appropriate sounds. She was able to say: *eye, watch, fish(f), fork(for), knife(ife), pen(pe), shoe(sh), apple(apbl), pie, puppy (bow-wow), car(ar), pipe, baby, hat(at), spoon(poon), gum (um), house(ouse), chair(cher), mouth(m), ball, up* and *nose(ose).*

In some instances she left off the initial or the final sound, depending upon its difficulty. Such unseen sounds as [k] and [g] were never developed during this short training period.

In addition to lip- and face-reading techniques, the clinician used the moto-kinesthetic method of speech treatment. This method is often used with children who have no speech at all. In this treatment, the clinician actually placed her hands on the child's mouth to show her where to begin movement for the sound, the direction the movement should take, how to shape the sound, and how long to hold the sound. For instance, in the sound of [o], the clinician placed her two fingers at the outer corners of the child's mouth and pushed the corners toward the center. However, this is not a difficult sound for the child to learn through lip-reading method. Some of the less easily seen sounds need particularly to be taught by this feeling method.

For the [k] sound, which is often difficult for the child to obtain since it is not seen readily, the clinician placed her fingers under the jaw and gave a slight pressure upward and

then suddenly released to suggest the plosive of the sound. For [t] the finger was placed lightly on the upper lip, which was given a light pressure and then a sudden release. The child felt how to talk.

By way of brief summary, in teaching this speechless child to talk, emphasis was placed upon three factors:

(1) Reeducation of emotional reactions in order to aid the child in releasing inhibitions.

(2) Stimulation through the sense of sight. Pictures and objects were used to interest the child in speaking. The clinician sat where the child could see her lips.

(3) Stimulation through the sense of feeling.

After working a few months with this child her obstinacy disappeared, but her hearing disability remained. Since every test and symptom indicated that Mary Anne was very hard of hearing, she was entered in a day class for the deaf the following year when she had reached the entrance age. The progress that Mary Anne had made toward speaking before her formal entry into the school was regarded by her new teacher as sufficiently great in extent to constitute a definite advantage with regard to her further training.

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HEARING AIDS: RECENT DEVELOPMENTS

THORREL B. FEST, M.Ph.
Albion College

I. Introduction

Most people would agree that the objective toward which research in the field of individual electrical hearing aids should be directed is the production of a dependable, durable, inconspicuous, low priced instrument possessing adequate fidelity at those frequencies necessary to the understanding of speech. Because there are so many problems involved in the production, advertising, fitting, financing, and servicing of the many aids on the market today, a survey of some of the more widely merchandised ones was undertaken. During two periods, from July to December, 1942, and February to April, 1944, Mrs. Helen Bruce, special teacher in the Madison, Wisconsin, schools, and the writer corresponded with fifteen manufacturers, held personal conferences with representatives of four of the companies, examined a number of different aids, talked with wearers, and read as extensively as the limited writings in the field would allow. The purpose was to examine objectives, the progress toward those objectives, and the relative difficulty of that progress.

As a background against which to consider these problems certain conditions should be recognized.

(a) At the present time it is not possible, nor even theoretically necessary, for a hearing aid to reproduce, either mechanically, or electrically, the total sound complex which impinges upon the human ear. Research seems to have established rather definitely that it is not even necessary to reproduce all frequencies present in the actual production of speech in order that the adult user of an aid may quite clearly understand (**13**, 3).

(b) Human nature being what it is, there is also present the personal or psychological factor, in addition to these matters involving purely objective investigation. This involves the demand on the part of the public for smaller and smaller instruments and, in many instances, pressure by the client to fit his preconceived ideas rather than his actual auditory needs. Closely allied are the variables which cannot be accurately measured and controlled, i.e. the resonance response of the cavity of the outer ear, and the ear's adjustment for pitch and intensity variations, which make it impossible in many cases to prescribe hearing aids as an oculist prescribes glasses.

(c) The relative age of the industry should also be considered. In one sense hearing aids are as old as man, for the cupping of the hand behind the pinna probably represented the first mechanical aid. But in the field of individual electrical aids, and particularly the vacuum tube models, the industry is in its infancy. Hayden (**6**) states that the first portable bone conduction receiver was not produced until 1932, and as late as 1938 portable vacuum tube aids resembled oversize Brownie cameras.

(d) Of equal importance is the fact that electrical hearing aids are simply specialized audio frequency amplifiers or, to put it another way, they are specialized public address systems. As such they benefit from general research in electronics but, because of the demand for a compact instrument with high fidelity, they also involve difficulties which are unique. Some understanding of the problems of alternating current and electronics is essential in order to appreciate adequately the task of building into a case about the size of the fingers of one's hand a microphone and amplifier that have a frequency response and fidelity that surpass those of the majority of radios. The produc-

tion problem is one in which each successive refinement and each truly progressive improvement in performance is made possible only by very disproportionate expenditures of talent, time and energy.

The position just outlined should in no sense be considered an excuse for inadequate performance, poor workmanship, inferior materials, or unethical methods of merchandising. The hard of hearing have been and continue to be exploited in a shameful manner (**10**, 85). It is known that certain standards of performance can be maintained and patients, otologists, speech correctionists and all other interested individuals are obligated to insist that within practical and physical limits anything less be regarded as unsatisfactory. If, by some miracle, the industry were free to concentrate on the problem of compensating for loss of hearing without the necessity of overcoming aversion to using an aid, these limits would be less restrictive.

Consideration of present accomplishments may be divided into five parts, namely, general, financial and merchandising, service and dependability, personal and psychological, and technical. A detailed examination of even one of these is impossible within the scope of this paper, the purpose of which is to attempt to point out some of the broader and more important aspects under each heading. In several instances problems that seem to merit continued investigation will be suggested.

II. General

Authorities and workers in the field are agreed that the introduction of the vacuum tube was the greatest single improvement which hearing aids enjoyed. It made possible the use of those less efficient microphones and receivers whose frequency responses were more extensive and which were capable of greater fidelity. It also solved some of the problems of frictional noise and positional problems that were so discouraging to users of carbon type aids. The vacuum tube was in part responsible for tripling the sale of individual aids. It was good for the hard of hearing, it was good for the manufacturer, and it was good for society.

It follows quite logically that as a company or an industry grows the extent and quality of its research shows improvement. As more aids are sold a greater reservoir of experience and information becomes available for study. The statistical investigation of hearing disabilities as to incidence, types, success with aids of different characteristics and similar matters has been responsible for many improvements and for greater efficiency in production. That hearing aids are a very personal matter in no sense means that the basic ideas of mass production may not be applied to the parts which go to make up the aid and even to certain steps in the assembly. At the same time it must be understood that these economies can be most effectively realized only when units are standardized and then produced in relatively large quantities. Insofar as these mass production techniques are employed and the expenses of design and research represent a

smaller *percentage* of gross business, the wearer may expect better merchandise at lower cost while the manufacturer may expect greater unit volume of sales and increased profit.

The last observation of a general nature deals with the matter of the frequency range essential to the understanding of speech. Opinion on this matter differs. In 1938 Hayden (**6**) wrote in the *Journal of the American Medical Association* that the frequencies between 256 and 2500 are most important. Articulation tests by the Bell Laboratories (**1**) indicate that when frequencies above 5,500 are filtered there is 96.5 per cent understanding. Wengel and West (**13**) in 1938 reported a loss of only .43 of one per cent in understandability when frequencies above 4,000 were eliminated. The most important thing to consider is the fact that while opinions differ as to the exact upper and lower limits necessary for an adult with normal auditory memory to understand speech, it is recognized that it is not necessary for the aid to reproduce *all* frequencies which the English language includes—particularly the extremes. At the same time it is recognized that the frequency range necessary for proper learning of speech is more extended. Since most hearing aids are fitted to individuals who already have learned speech, the necessity of extending the range is not so great as might otherwise be the case, and the manufacturer is relatively free to concentrate on fidelity within limits of 200 to 4,000 cycles per second.

III. Financial and Merchandising

Mention has been made of merchandising methods and the improvements in this field. A point of special interest is the increasing tendency of manufacturers and otologists to work together. During the latter part of 1930 a number of writers stressed the need for otologists to familiarize themselves with the problems of the hard of hearing. The establishment of a sub-committee of the Council of Physical Therapy of the American Medical Association to determine minimum requirements for acceptable hearing aids was certainly a movement in the right direction. That committee report (**12**) became effective January 1, 1940. The sub-committee on audiometers was of no less importance, for the audiogram is generally a factor in fitting an aid. It is hoped that this beginning of active cooperation and understanding between the two groups, otologists and manufacturers, may continue to expand and develop. If there develops in the field of hearing the same hybrid that has developed in the field of vision, pseudo specialists who operate independently of oculist or producer and with a minimum of training and basic knowledge, all concerned stand to lose.

The cost of an aid is of vital importance to many wearers. Our investigation indicated that cash prices of carbon type aids started at $55 while the vacuum tube amplifiers ranged from $40 to approximately $200. In one sense those prices are not unreasonable. For many, a dependable hearing aid means economic

self-sufficiency, social respectability and a new life. Installment purchase is possible. There are instances of price adjustment to fit the ability to pay. The cost of an aid may be said to represent not alone the materials and work on the aid itself but also the inventive genius, the research, the construction of a precision instrument and the cost of selling. But considered from another angle, some prices are too high and there is no escape from that conclusion. Those who most need aids, either economically or socially, are likely to be the ones least able to pay for even the most unsatisfactory models. If, as Dr. Kranz (8) has estimated, there are from three to five million adults with serious hearing disabilities, it is certain that aids are not being put on even a goodly proportion of this number. Price is not the only explanation but it is one. Consider for a moment the spread between the actual cost of the parts going into a hearing aid and the cost of the aid itself. Most tubes cost the user from $1.50 to $3.50 each. If that represented actual wholesale cost, which it does not, then the maximum cost of tubes in a three tube model would be $10.50. Even super-insulated, shielded condensers and precision resistors are now the products of mass production. Nevertheless, list prices for complete hearing aids of comparable power and size may differ as much as $30 and in some cases $100. At the time of writing only one company was marketing a dependable vacuum tube aid at a price which the majority of people could easily pay. Some of these price differences may be justified by extra care in fitting, quality of service and extent of guarantee. Production methods may contribute to the differential. But the fact still remains that the cost of most aids will have to be greatly reduced before all of the three million people who might find help in hearing aids become wearers.

Closely related to this is the matter, partly technical, of battery cost and quality. Wet cells have been developed that are safe and dependable. Their constant voltage is a great aid to wearers of the carbon type device. The matter of cost of operation does not look so imposing when reduced to a day-to-day basis. It is when the monthly and yearly cost is figured that the challenge appears. Company reports on the cost of operation for a vacuum tube aid for a 10-hour day range from four to seven cents. That means from $1.20 to $2.10 per month. Some companies frankly say that the cost will approximate 13 to 20 cents per day. That would mean $3.90 to $6.00 per month. One company reported that it felt the cost of operation was a major problem challenging the industry. Certain other companies seem to feel that this problem has been fairly well solved. One aid uses a unique circuit in which sensitivity and acoustical output are maintained at a high level while battery consumption is surprisingly low. Another innovation is a small power pack that operates off the conventional 110 volt 60 cycle line. This can greatly reduce cost of operation for those users whose work does not neces-

sitate great freedom of movement. If continued research makes it possible to reduce cost of operation further by devising more efficient and cheaper batteries, or by developing other tubes or circuits that will operate with even lower power drain, a major service will have been rendered. People will hear better at less expense. And if at the same time merchandising methods and production can be integrated in such a manner as to reduce the unit cost to the wearer then more people will benefit.

IV. Service and Dependability

Dependability and service are of vital importance to the wearer, for should his aid frequently fail it is not only inconvenient but also may make it impossible for him to perform certain types of work. If, when the aid does fail, he cannot secure prompt and satisfactory service his situation may be tragic. Fortunately the reputation for dependability is extremely good. People in all positions and occupations use hearing aids successfully. They are found on individuals in noisy shops and factories. People working in hot and humid atmospheres find that aids continue to function. It is really surprising how efficient they are in terms of the abuse they often receive. It is true that certain crystal microphones and receivers cannot be subjected to high temperatures but even that problem is being attacked.

Many of the companies today make a point of the fact that they sell not just a hearing aid, but service. To back this up they have attempted to spread their distributing and servicing organizations over the entire continent and even the world. The importance of this to the travelling public is evident. The availability of such service will be of even greater importance to that sizeable group of individuals that may be expected to suffer hearing injuries as a result of this war. An innovation in this field of service is the equal exchange plan sponsored by at least one company. Servicing is then carried out at the factory. This allows the company to make a more careful check and determine causes of failure with a view to anticipating difficulties in subsequent models.

In terms of service the really vital matter is batteries. In normal times most manufacturers preferred to design their own terminals and adapters but it should be pointed out that several very prominent manufacturers have always favored standardization and use flashlight cells and/or standard type B batteries. In the beginning it was probably necessary for the producer to design his own adapters or terminals. Later it became profitable to continue with an individual design. Such specialized terminals or batteries meant that the wearer had to secure batteries from the local or regional office. This gave the office a chance to keep check on the function of the instrument, which was all to the good, and it also kept the battery business in the company which policy was not without its benefits. But war changed even hearing aid batteries. The War Production Board found that the

hearing aids on the market in 1943 called for 56 different varities of A batteries and 175 different varieties of B batteries (3). In most instances the differences were in the connectors. In an effort to remedy this indefensible situation the Board issued order L-71a reducing the A battery types to two and the B battery types to four. An arrangement was worked out whereby each manufacturer agreed to fit at cost adapters to those aids already in service so that the standard batteries might be used. In order to insure an adequate supply of batteries two new manufacturers were called into the field.

Whether this standardization will be continued past the present emergency is impossible to say. It would seem that little could be gained by reverting to the former situation that encouraged every producer to develop a unique battery connection. What the user of the aid is interested in is hearing. From his point of view there is no reason why batteries should not be universally procurable. A batteries are all 1.5 volt or multiples thereof and B battery voltages are likewise standardized. Research in the field of battery construction and design is led by the large battery manufacturers and it is doubtful that any one hearing aid company enjoys a marked advantage in the quality of power supply. There certainly should be no objection to the companies continuing to sell batteries and even having their own brand names stamped on the battery, but for the convenience of the users it would seem that some form of standardization might be retained.

V. Personal and Psychological

It has previously been noted that the number of uncontrolled variables in the fitting of a hearing aid is such that much depends on the individual's response to tests with the instrument in place. This entire problem of how most effectively to adapt the hearing aid to individual physical and psychological characteristics is complex in the extreme. One company feels it is a field requiring special attention. Undoubtedly all companies are concerned with this matter. The industry is certainly to be commended for continuing to make great strides in reducing the size and weight of vacuum tube aids. What one producer claimed to be the smallest aid produced in 1937 measured 8″ x 5″ x 2″ which equals 80 cubic inches. With batteries it weighed well over three pounds. Today there are a number of aids on the market smaller than one's hand. They range in size from 3.5″ x 2.5″ x .75″, 6.6 cubic inches or one-twelfth the size of the smallest 1937 model, on up to 3″ x 6″ x 1″, which is about one-fourth the size of the 1937 model. The weight of aids varies from about 3 to 7 ounces. Batteries weigh from 6 to 14 ounces and are proportionately small. Typical is a 3″ x 5″ x 1.5″ battery unit. That means that the individual carries a total weight of from 0.5 to 1.25 pounds. Provisions for concealment have kept pace. Very little more could be asked unless the manufacturer is expected to build

the aid into the individual's ear, and that has been suggested (4).

Another very encouraging observation is that hearing aids are being fitted to increasing extremes of the age range. There are always exceptions but most companies report that they fit children as young as five years if the child is sufficiently intelligent and cooperative. Some report that they do not like to attempt fittings on children under ten. Lowering the age limit is in keeping with the experience in some foreign clinics; Holmgren (7) of Stockholm particularly recommends fitting at as early an age as possible. If the aid is sufficiently rugged and if its frequency response is sufficiently extended, the advantages of early fitting in terms of learning speech are evident.

There is no doubt that the technique of fitting hearing aids has been greatly improved. Statistical treatment has been applied to large numbers of audiograms taken by skilled operators. Curve characteristics are sought and expectancies set up. The equipment used is of an increasingly high quality and its practicability and adaptability are subject to constant study. The actual steps in diagnosing a hearing problem and fitting an aid are planned so as to be maximally effective. Master aids are used by several companies. Trial periods for the customer are arranged and provision for changes of combinations is usually included in the selling agreement. These and other improvements are all commendable. But at the same time there is danger that in an effort to develop a routine procedure, to standardize the steps and to conventionalize the approach, too little attention will be given the basic training and motivation of the individual who sells the aid. Lloyd George once said that the first duty of a statesman is to hold office, otherwise he could not be a statesman. And so it is with the hearing aid salesman—otherwise he would not continue to be a salesman. This condition puts aids on individuals and brings hearing within the reach of persons who would otherwise not enjoy its advantages. But at the same time the approach is basically unsound. The emphasis cannot possibly be on fitting a particular individual with what will best aid that individual, for the salesman is fundamentally committed to the premise that *his* product is the answer to the hearing problem. The company provides him with equipment and technique. He is given a course of training that is sufficiently broad to meet his specific need and no more. He is judged by results—and that means customers.

Closely related to the problem of selling aids that meet the specialized needs of individuals is the problem of scientifically designed tests of function of the aid when on the patient. Most companies now use audiograms, both before and after applying an aid. Number series and conversation are popular means of checking on the individual's ability to hear and understand when wearing the aid. Unless carefully controlled and administered, such tests may not be accurate because of variations in conditions at the time of testing, lip reading, natural tendencies to supply

sequential material, and similar matters. What is needed is scientifically constructed word lists or speech tests that include all essential frequencies and which can be administered under controlled conditions. Any acoustical engineer understands that temperature and humidity affect the transmission of sound and that a user will hear sounds of given intensity at greater distances on a cold winter day than on a warm, rainy day in summer. Background noises which may be present in the working conditions where the aid will be worn are seldom found in the testing or fitting situation. If these are amplified unduly, the aid may be very irritating or even useless. Consequently the conditions under which fitting is carried out should take into account and control or compensate for as many of these factors as possible. Professor Robert West (**14**) has devised a technique for fitting hearing aids that employs word tests of comprehension. It gives a relatively accurate indication of what any aid will do for an individual's hearing. It should bear study by those interested in fitting or prescribing hearing aids.

It may be that we will eventually arrive at some standard formula for prescribing hearing aids. Even if we do not succeed in achieving that result we can and should establish more independent hearing aid clinics where people can come for tests and compare, under the same conditions, different aids. Having the benefit of the clinic's tests and recommendations, they are then free to make contact with various manufacturers and select the aid desired. Such a clinic was conceived by Dr. Max A. Goldstein and established at Central Institute for the Deaf, St. Louis, Missouri. It has been in operation since September, 1941. A report covering certain procedures, apparatus and results has been published (**11**) and should serve to stimulate further consideration of hearing aid clinics and their possibilities. As late as 1942 there were only 12 hearing aid clinics in the United States but the rehabilitation of both military and civilian personnel will require many more well equipped and properly staffed centers.[1] It might even be practical for reputable manufacturers cooperatively to finance such a venture as a sales promotion plan and also as a means of driving from the field those unethical producers that prey upon the ignorance and handicaps of the hard of hearing public.

VI. Technical

This phase of the hearing aid problem is the largest, most complex, and at the same time the most fundamental of all, for it is upon developments of a technical nature that all the other

[1]At the present time, February, 1944, the military program for casualties involving hearing injuries is centered in three hospitals (**9**), Deshon General Hospital, Butler, Pennsylvania; Hoff General Hospital, Santa Barbara, California, and Borden General Hospital, Chickasha, Oklahoma. The experience gained in these centers where relatively large numbers of cases may be expected should contribute much to our technical and educational knowledge of the problems of individuals with hearing impairments.

factors previously discussed depend. Three major points will be considered. The first may be termed the performance characteristics of vacuum tube amplifiers. Sensitivity, gain, frequency response and fidelity are the terms which plague the designer and producer of hearing aids.

By *sensitivity* is meant the ability of the instrument to respond and to do this equally well at all frequencies. The development of the crystal microphone and its use in vacuum tube circuits has made possible a hearing aid which gives satisfactory sensitivity. When the sensitivity curve of a crystal microphone is compared with that of other types the difference is striking. It is true that the energy output of this type of microphone is very low but with vacuum tube amplification adequate compensation is possible.

Gain, or amplification factor, refers to the ability of the circuit to build up and deliver to the receiver vibrations striking the microphone and to which the microphone is sensitive. In some cases it is desired that this be constant for all frequencies while in other cases selective amplification is the objective. In the matter of amplification manufacturers make various claims for their products. Some aids are advertised as having a gain of 95 db. and there are few of which 60 db. are not claimed. Since the decibel is fundamentally a unit of comparison (**5**, 28) these figures mean little unless the intensity of the original sound is specified. A study of tests conducted by the Council of Physical Therapy of the American Medical Association (**2**) suggests that some of these gains claimed must be based on the use of original sounds having considerably greater intensity than normal threshold intensities. In the above tests the volume control settings for each aid were not quite uniform, but such variations would not account for the marked difference between 95 db. claimed and the maximum gain of 48 db. which was secured with but one aid and then at only the 1024 d.v. tone. The decibel gain in these tests was measured for tones at normal threshold intensity.

In commenting on this problem of amplification the late Professor C. C. Bunch (**2**) has pointed out that the hard of hearing person is not interested in sounds of low intensity. Such individuals want a hearing aid to enable them to hear and understand normal conversation. Professor Bunch further suggested that by calculating amplification characteristics on a basis of conversational speech, 50 to 60 db. above the threshold, a much clearer conception of what a particular hearing aid will do may be obtained. The problem is not one of gain alone but of how to adapt this to the individual's auditory needs.

This leads directly to the problem of *frequency response*. Each manufacturer attempts to produce an instrument that can be easily adjusted to compensate for those hearing losses which have been found to be most common. Some aids are more versatile in this respect than others. Most of the leading ones have two,

three, or four-position tone controls for this purpose. Usually three settings of the control are possible. One position is intended to accentuate the low frequencies and suppress others, a second setting amplifies the high frequencies, while the third possibility provides for approximately equal gain at all frequencies to which the instrument responds. Some further control of frequency may be secured by selection of a receiver with the proper characteristics. But this selective amplification is usually relative and the over-all range of response may be somewhat limited. Few if any aids give usable amplification at 128 d.v., and at 256 d.v. some aids are inadequate. At the other end of the spectrum two of the nine aids tested by the Council of Physical Therapy (2) did not amplify 4096 d.v. In many cases the amplification is largely between 500 d.v. and 3000 d.v., with consistent peaking at 1024 d.v. Certainly if the entire speech range is not essential to understanding, nevertheless the presence of the frequencies at either extreme might add to the enjoyment of the wearer. There is, however, the possibility that amplification of the very high frequencies might bring to the wearer certain disagreeable noises that he would not desire. Some application of automatic volume control would do much to solve this problem. Aids are sold and can be built that give exceptionally wide frequency response but most companies find it more practical to confine the response curves to the 256 to 3500 cycle range.

One company states that more exact and reliable frequency control is a major problem; another feels that its methods of adjusting for tone control meet all needs; a third company holds that each aid must be built for the particular individual's problems. Still another manufacturer wants the user to be able to adjust the frequency response whenever desired and so places this control on the outside of the case where it is easily accessable; others provide for this frequency selection to be made at the time the aid is fitted and locate the adjustment mechanism inside the case where it cannot be quickly changed.

The fourth characteristic is *fidelity* of response. How exactly does the instrument reproduce what comes to it? This is obviously a factor of frequency, amplification and sensitivity and the particular conditions should be specified. It is possible by means of standardized oscillators to test this characteristic of an amplifier. A more recent technique has been to use what is termed a square wave rather than a sine wave and thus secure a more rigorous check on the instrument. This matter of response characteristics of the amplifiers may be summed up by saying that the goods sell everywhere at a fair price and in audio frequency amplifiers that price is generally calculable in advance. Sensitivity and gain are generally adequate but frequency response and fidelity need improvement. If frequency response were all that the companies desire, no doubt such response curves would be more readily available and be more prominently mentioned in advertising.

Closely related to the matter of amplification is the problem of the ear mold or plastic. Most manufacturers have from two to four different size ear molds available and the patient chooses one that best fits his ear. In many instances this seems to work quite well but in certain individuals the external canal is of such shape and size that a truly satisfactory fit is not secured. If at the time of fitting, or while the aid is being worn, the plastic does not fit accurately any leakage of sound will be picked up by the microphone and reamplified, resulting in various degrees of distortion. This is particularly true where the frequencies are high and the gain great. Commonly known as feed-back, it may result in squealing and mean that the full potentialities of the aid can not be realized. Nearly all of this difficulty could be eliminated if each user had an ear plug molded to fit his particular ear. If, in addition, the means of connection between the ear plug and the receiver were standardized, so that any aid and its receivers might be used with the patient's individually fitted plastic, another variable in the fitting of the aid would be more rigidly controlled and this would make possible better comparison of the various aids being tried.

The third major technical accomplishment has to do with the reduction of incidental noise or frictional noise picked up by either carbon or vacuum tube aids. Many buzzings, hummings and noises of static or from other sources are present in our radios but offer no major problem since they are masked by the program. In a hearing aid that is another matter. In carbon aids it is especially a problem as regards the position of the microphone. Many microphones will not function, or function poorly and with great incidental noise, when the person bends over, lies down, or moves vigorously. The simple matter of the carbon granules rubbing over each other results in static. Some progress has been made to correct this. The small noises, close to the microphone, of clothing rubbing over the case or catching on the case, have been reduced in all types by the use of dampeners in the circuit, live rubber linings in the case, and the simple and effective expedient of making very smooth cases with rounded corners. Bumps and jars that used to be most painful to the wearers of some aids are definitely less serious matters with the advent of the crystal microphone. And, finally, the improvement of materials has tended to eliminate many functional noises caused by current variation, change of conductance of a resistor, or the capacitance variations of a condenser.

VII. Summary

1. In general, progress in the development of hearing aids has been very good. Laymen and speech correctionists need to realize what the producer already knows—that the chain is no stronger than its weakest link. The aid consists of a microphone, amplifier and receiver. It is no better than the least adequate of these and improvement in one must be matched by corresponding improvement in the others.

2. At least one company is making a serious effort to produce and sell vacuum tube hearing aids at a price which most people can pay. It is hoped that other producers will be able to follow this lead. The war, with its bombing of both civilian and military groups, may produce an unusual number of hearing casualties. Excessively expensive hearing aids will greatly handicap the rehabilitation of these individuals.

3. There is need for continued attention to skilled prescription, or at least more skilled fitting. Probably the ideal would be independent hearing aid clinics.

4. The standardization of battery connections might well be continued after the present emergency has passed. It is highly desirable from the user's point of view and need not seriously interfere with the manufacturers' efforts to check on users' aids.

5. The problem of frequency response and control should continue to receive study, with the object of securing more extended response and of more effectively controlling this response to meet the individual's particular needs.

6. Continued efforts must be made to educate the hard of hearing public so that they understand what they are buying and what they can and should get for their money.

7. Speech pathologists and other workers in the field need a more complete understanding of the problems of the hard of hearing and of what to expect from a hearing aid in order that they may give intelligent advice.

8. It is encouraging to note that little if any basic difficulty is encountered by the industry in securing satisfactory priority numbers. Practically every manufacturer indicates that he has been able to serve those individuals definitely dependent on aids.

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A COUNTY SPEECH AND HEARING CONSERVATION PROGRAM

ALFRED LARR, B.A.
Indiana State Teachers College

I. INTRODUCTION

Speech correction has long been an integral part of the curriculum in most larger cities throughout the country. Hearing conservation, too, is rapidly growing in the more progressive of our municipal school corporations. As yet, however, comparatively few county school systems have made provisions to meet adequately the need in these two phases of special education. In Indiana, which is a fairly representative midwestern state, in which legal provisions are made for state reimbursement of the greater part of the cost to local districts of supplies and of special teachers, only two counties in 1942 employed a speech and/or hearing conservationist under the Special Class Law. It is the purpose of this paper to present a practical method used in introducing both speech correction and hearing conservation in a county system with an enrollment of 6,000 pupils and a personnel of 250 teachers. In addition, a study of teacher prediction of hearing defects will be summarized.

The problem of meeting the needs of speech and hearing handicapped children in the schools of Vigo County, Indiana, had been recognized for a number of years. Due to budget limitations and the shortage of special teachers, however, it remained for the classroom teacher to deal with speech and hearing cases. The added impetus supplied by the Audiometer Law of 1941 precipitated the decision to engage the services of a clinician to set up a combined speech and hearing program. The ultimate aim proposed at the outset was the development of a county-wide clinical service with sufficient facilities and personnel to serve the community adequately in ensuing years. The twelve townships voted to share the cost of salary and equipment. The equipment included a group audiometer, a pure tone audiometer and a portable recorder. Phonograph needles, recording discs, mimeograph paper and other incidental materials were included as necessary supplies, three-fourths of the cost of which was borne by the State Board of Education.

The director began with these objectives for the first year's work: (1) To organize speech improvement and hearing conservation in the county schools; (2) to supervise audiometric testing of the children in the county schools; (3) to conduct a survey of speech defects; (4) to administer remedial instruction to as many speech defectives as possible.

II. Preliminary Organization

The speech and hearing program is, of course, no more than a supplement to the classroom teacher's work and, thus, it is only through close coordination with her program that optimal results can be obtained. From the beginning the classroom teacher's suggestions and criticisms were appreciatively received. The first step, a speech examination of children listed by teachers as defectives, was conducted in cooperation with the Speech Clinic of Indiana State Teachers College. Of 57 pupils examined by a student clinician, 30 were listed on a petition to the State Board for the establishment of special classes. Only students whose defective speech had obvious physical involvement were included in the petition, since the law specifies that only physical defectives are eligible for special instruction. Malocclusion, deviated septum, cleft palate, hypertrophied tonsils, tongue-tie and developmental deficiency were among the more numerous defects. Verification of the diagnosis in each case was made by Dr. D. W. Morris, Director of the Speech Clinic at Indiana State Teachers College.

III. The Program

Every effort was made to design the program along lines approved by the local medical association. A tentative outline was discussed with doctors in several townships and a number of changes that improved the program were made at their suggestion. Considerable public relations work was carried on during the first few weeks. Newspaper articles, talks before Parent-Teacher Association meetings and bulletins sent to parents and teachers had the two-fold purpose of explaining this new service and of enlisting cooperation.

Group Hearing Testing and Speech Survey. Schools varied in size from one-room schools with an enrollment of only thirty pupils to fairly large high schools enrolling over five hundred. Before the group hearing test or the speech examination was made lists of children suspected of being speech or hearing defectives were collected from the teachers. At the same time arrangements for the organization and administration of the tests were made with the principal of each school.

Group hearing tests and speech examinations were done during the initial scheduled visit to each school. A procedure found workable in smaller schools was that of administering the first screen test in the morning, conducting speech examinations in the afternoon and giving a retest during the last hour of the day to those pupils who had shown at least a 9 decibel hearing loss on the first test. Group hearing tests and speech examinations in the county circuit were completed in approximately five weeks. On the second trip the pure tone test was given to children who still did not show less than a 9 decibel group test score. Moreover, clinical work was begun with outstanding speech defectives at that time. Obviously,

only a small percentage of the 345 students who had been classified by their teachers as speech defectives could possibly be given clinical attention by one correctionist. In selecting the few who could be given remedial instruction, cooperation with the teachers was highly important. It was felt necessary, however, to suggest to some teachers that it was the clinician's civic responsibility to spend the bulk of his time with those future citizens who indicated reasonable promise of returns in later contribution to society. The speech correctionist did not feel justified in spending most of his time with behavior and low mentality cases when his time could be spent more profitably with cases in which defective speech stood as a barrier to a potentially greater social contribution. It is interesting to note that only 7 per cent of the 345 pupils who had been classified by their teachers as speech defectives were eliminated by the clinician. They were eliminated on the ground that their difficulty was not primarily a clinical speech problem. Behavior and low mentality cases comprised the greater number of this group. Incidentally, this method whereby classroom teachers chose the pupils to be given speech examinations was substituted for the ideal method, that of diagnosing each child in the school, because of time limitations.

Teacher Education. Although the objectives during the first year were to organize and plan for future development, the speech correctionist desired to do as much immediate remedial work as possible. Because of insufficient time to talk directly with every person concerned, printed material was used whenever practicable. Teachers were given printed group test hearing instructions, speech bulletins and, in some cases, drill sentences for integrating classroom work with articulatory practice. Very valuable assistance was given by teachers who encouraged their speech defectives to practice on sounds which they had previously produced in clinical practice, but on which they needed to practice continually to overcome habitual misarticulation.

Community Education. Since the public attitude toward such a program will, to a large extent, determine its growth, the dissemination of information to the public is highly important. Newspaper copy, Parent-Teacher meeting addresses, bulletins and home visits were utilized as media for educating the public in regard to speech and hearing conservation.

Follow-up Hearing Work. In the follow-up phase of the work four steps were carried out. First, teachers were given a bulletin designed to assist them in planning classroom adjustments for the acoustically handicapped child. Second, an endeavor was made to confer with teachers regarding their special cases. Third, parents of children who scored a 9 decibel hearing loss, or more, in grades one to nine were invited to the school on a scheduled day for the purpose of gaining case

history data and of discussing home adjustments for the child. Of the 279 parents who were invited, 121 came for conference. Fifty-two were advised to have the child examined by the family doctor. A hearing test after medical treatment is planned in each case. (The present director's time is divided between speech correction, hearing therapy, pure tone testing and follow-up hearing work. The screen testing, which consumed much of the director's time the previour year, is done by health teachers and other qualified instructors who assisted the clinician last year in their respective schools.)

IV. Teacher Prediction of Hearing Defects

In order to get some indication of the interest and attention that teachers give to the existence of hearing deficiency in their classrooms, teacher judgments were compared with test findings. Mimeographed forms, with the printed instructions to list the "pupils who seem to have some degree of hearing impairment," were given to each teacher two weeks after the school year had begun. Three weeks elapsed before any lists were collected from the teachers; all lists were collected before the sixth week of the school year.

One hundred sixty teachers of grades 1-6 in Vigo County submitted lists of children involving a total of 201 pupils, suspected of having some degree of hearing deficiency. Each pupil in this group was tested by the group audiometer method (along with the rest of the children in the county schools). Those pupils who scored a 9 decibel or greater hearing loss after complete group tests[1] were given a pure tone audiometer test.

In any interpretation of the above figures it must be noted that little scientific control was used. The data provide, at best, only a rough indication of the attention that grade teachers pay to hearing impairment. No instructions were given regarding the care teachers should exercise in finding students who seemed to have poor hearing. Three teachers stated after

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[1]A group retest the same day as the initial group test, followed by another test, if a 9 decibel loss is still indicated, at least one month later is here considered a complete group audiometer test.

Fifty-seven (23%) of the 201 pupils selected as defective by the teachers scored a 9 decibel or greater hearing loss in *both* ears; 127 (63%) of the group showed a 9 decibel or greater loss in *one* ear; 74 (31%) had a 6 decibel or lesser hearing loss in *both* ears and 48 (23%) were found to have either a +3, 0, or −3 decibel hearing loss in one or both ears.

In the 160 classrooms studied, 298 pupils scored a 9 decibel or greater hearing loss in *one or both ears;* 57 (19 per cent of the defective hearing group) had been correctly predicted by the teachers. One hundred ten children had a 9 decibel or greater hearing loss in *both* ears; 48 (43%) of that number had been suspected of subnormal hearing by the teacher. Forty-two pupils scored a hearing loss of 18 decibels in *one or both ears;* 29 (69%) had been accurately predicted. Nineteen students showed a hearing loss of 18 decibels or more in *both* ears; 15 (80%) had been listed as defective by their teachers.

handing in their lists of suspected defectives that they used the watch test to determine which pupils had poor hearing. Six teachers said that they filled out their lists immediately upon receiving the mimeographed forms. The implication of the study is that, without the use of audiometers, teachers in grades one through six tend to observe the existence of an 18 decibel or greater hearing loss in both ears, but do not readily observe slighter losses in one or both ears.

V. Concluding Statement

This outline of a method which has been used to meet speech and hearing needs in a county school system is offered with the hope that it may be of some value to other school systems in which the teachers and administrators are striving to remedy and prevent those handicaps which, in war as in peace, prevent the complete realization of our democratic goal, equality of opportunity, in the schools of America today. The program has proved to be workable in a county school system and is being continued.

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A PERSONALITY STUDY OF STUTTERERS AND NON-STUTTERERS

LaVANGE HUNT RICHARDSON, Ph.D.
University of Southern California

I. Introduction

Investigation of the personalities of stutterers has been hampered because adequate tests have not been available (**13**). Those used heretofore have been principally paper and pencil tests, such as the Woodworth-Cady and Woodworth-Matthews questionnaires, and the Kent-Rosanoff association test which McDowell (**12**) used in her study of child stutterers. The Woodworth-House Mental Hygiene Inventory was used by Johnson (**8**) in a study of adult male stutterers, and Bender (**2**, **3**) has made a more recent study of college male stutterers using the Bernreuter Personality Inventory. These instruments, however, are limited in scope. What has been needed is a qualitative type of test which would reveal the personality as an organized whole, a *gestalt*. Two such tests which are believed to fulfill this requirement more adequately than do such paper and pencil tests as the ones mentioned above are the Rorschach ink-blot and the Murray Thematic Apperception tests. Although there is much research still to be done on these two instruments in order to render them more adequate for purposes of objective measurement, they have already been used extensively and with a measure of success in clinics and psychopathic hospitals (**1**, **6**, **10**, **11**). Meltzer (**13**) has made a study of adolescent male and female stutterers in which he used the Rorschach ink-blot test.

II. Problem

The purpose of this study was to investigate the differences between adult stutterers and non-stutterers by means of a questionnaire and two projective-type personality tests. The specific problems under consideration were:

1. Do adult stutterers as a group differ from non-stutterers in social introversion, thinking introversion, depression, cycloid tendencies and rhathymia, or happy-go-lucky attitudes, as measured by the Guilford Inventory of Factors S T D C R ?
2. Is the structure of the personality, including the potential forces and tensions within, as revealed by the Rorschach ink-blot test, different in adult stutterers and non-stutterers?
3. Do adult stutterers differ from non-stutterers in terms of the dynamic content of personality, i.e., needs, frustrations and attitudes, as revealed by the Thematic Apperception Test?
4. Of what value are projective tests in the treatment of adult stutterers?

There is still much to be learned about stutterers' personalities. Previous studies of this problem have been limited either to the questionnaire or projective-type of test. Therefore, a study in which both types would be used seemed practical for bringing about a more inclusive and detailed body of information.

Moreover, since the adult stutterer realizes more forcefully the social significance of impaired speech than does the child, and since it is more difficult to relieve the adult of his stuttering, any further information concerning his personality is to be desired by the speech correctionist and clinical psychologist.

III. Subjects and Procedure

The subjects for this study were 30 stutterers, 8 women and 22 men. They were members of a speech correction class in the Psychology Clinic at the University of Southern California. The age range was 17 to 48 years, the average age being 27.8 years. A control group of 30 non-stutterers was matched with the stutterers for age (plus or minus five years), sex, decile rating on the Henmon-Nelson Tests of Mental Ability, Form A, and college experience.

Four tests were given each individual: the Henmon-Nelson Tests of Mental Ability, Form A, the Guilford Inventory of Factors S T D C R, the Rorschach ink-blot test and the Murray Thematic Apperception Test. These were all administered by the writer. The non-stutterers and stutterers were selected from such sources as business and professional groups, the industries and trades, the armed forces, and high school, college and university students.

The results of this study have been interpreted in terms of the personality patterns they seem to reveal, the findings from the two groups have been compared, and an attempt has been made to determine the statistical significance of the differences between the groups.

Limitations of the Study

In such an investigation there are certain limitations which pertain to the tests themselves.

The questionnaire-type test. There is opportunity for the subject to distort the results by answering in the manner he knows to be desirable rather than in terms of how he actually feels or acts. Moreover, the subject is in most instances only partially able to say to what extent the responses made to such a test represent a valid indication of his personality. This is due in part to the fact that the subject is forced to react in one specific manner. From the experimenter's point of view, there is little possibility of discovering how and why the subject arrived at a particular response. For these and possibly other reasons the validity of such an inventory can only be roughly estimated; i.e., the extent to which the instrument measures what it is designed to measure is not known.

The projective-type test. The limitations of such tests as the Rorschach ink-blot and the Thematic Apperception tests are obvious. Although they present a so-called "total-action" picture of the personality, there is little opportunity for an objective evaluation of the subject's responses. To be objective a test must yield results which can be measured or counted and which will enable experimenters of experience and skill to arrive at similar interpretations. Although in the last ten years there has been much improvement in the administration and scoring of the Rorschach ink-blot test, only in its administration has an important degree of objectivity been employed (7).

The most serious limitation of the Thematic Apperception Test is that the results do not yield material from which specific attitudes and complexes are readily ascertained.

There are limitations pertaining to the particular populations sampled in this study. The comparatively small number of subjects in the experimental and the control group, 30 in each, constitutes another inherent weakness. However, in the experiment there are some 1,200 stories in the Thematic Apperception responses and over 2,900 responses to the Rorschach ink-blot test to be evaluated. This quantity of data tends to negate some to the weakness due to sampling.

Characteristics of the Tests Used in this Study

The tests selected for this research were chosen because they fulfilled certain requirements essential to a study of adult stutterers.

The Henmon-Nelson Tests of Mental Ability. These tests, primarily designed to measure aptitude for college success, are group tests requiring one-half hour for their administration. Form A was used in this study. The 90 items involved are arranged in order of increasing difficulty. This mental test is adaptable for the study of late adolescent and adult stutterers, the majority of whom had graduated from high school or had had college training. In terms of college experience nineteen were freshmen, two were sophomores, three were juniors and six were seniors.

An Inventory of Factors S T D C R. Jung's theory of psychological types has influenced the development of questionnaires for the measurement of introversion-extroversion (**2**, 59-62). The Inventory of Factors S T D C R is one in this category; these factors taken together probably cover the area of personality generally encompassed by the concept of introversion-extroversion.

Although personality questionnaires of this type have encountered criticisms such as those listed above, they have been widely used. This inventory has been carefully devised on the basis of factor analysis and thus appears to be appropriate for such a study as this where the purpose is to determine whether stutterers as a group (as opposed to non-stutterers) reveal introvertive-extrovertive tendencies.

The Rorschach Ink-blot Test. Klopfer and Kelley (**9**, 13-14) explain the development of projective tests as follows:

> Out of the need to bridge the gap between the merely subjective "understanding" of another personality gained through clinical observation, and the objective measuring of individual differences with little or no understanding of their origin or deeper meaning, there developed a new approach which may be described . . . by the term "projective methods of personality diagnosis."
>
> The difference between the Rorschach method and other projective techniques using visual stimulus material and verbal reactions, lies chiefly in the degree to which the material has some objective meaning which it tends to impose upon the subject. A projective technique using material which is more structured than the Rorschach material is Murray's "Thematic Apperception Test." The use of picture material in this test, instead of less meaningful ink blots, shifts the emphasis from the way of handling the situation to the imaginative content. This picture content is naturally rather elusive with regard to objective comparison and more under the influence of conscious control. In this respect the "Thematic Apperception Test" is more similar to Jung's free-association technique than to the Rorschach method.

In the projective techniques it is assumed that the "mental" procedure which the individual adopts and the emotional reactions he displays in the experimental situation operate similarly when he meets other life situations. Thus, in reacting to the test he is giving a sampling of his characteristic behavior. The examiner reconstructs the personality of the subject from his projected attitudes.

This test has been widely used in researches on juvenile delinquents and adult criminals, in studies of stutterers, alcoholics, twins and in anthropological field studies. (**9**, 9). It has been validated clinically and has been used to

identify children who are potential asylum and clinic cases, mental defectives, neurotics and psychopathics. A large number of investigators have maintained that as a clinical instrument it is valuable in diagnosing inhibitions, excessive phantasy living, inferiority feelings and conflicts (**6**).

The Thematic Apperception Test. This test reflects the trend of the past twenty years in the development of methods for the investigation of personality through projective methods. Murray and his colleagues (**15**) at Harvard have made a personality study of fifty college men over a period of five years. They used some sixteen methods for investigating personality, such as ink-blots, art work, music and pictures. The Thematic Apperception Test, in which a series of pictures is administered, was one of the tests developed in their investigation. Since the original series, two revisions have been made. The first revision, which is the one used in this study, consists of thirty pictures. The first ten are shown to both sexes. Following the tenth picture the male subjects are shown pictures M 11 to M 20, and female subjects are shown pictures F 11 to F 20.

Morgan and Murray (**14**) in 1935 published the first article setting forth their theory. They believed the patients taking the test revealed unconscious trends. The test is based upon the probability that when a person interprets an ambiguous social situation he is apt to expose his own personality as much as the phenomenon to which he is attending. Since 1938 this test has been used clinically in the study of psychotic and neurotic patients. It has been reported to reveal latent homosexual drives, deep-seated sibling rivalries, mother fixations, repressed guilt and important traumas.

Administration, Scoring and Interpretation of the Tests

The Henmon-Nelson Test of Mental Ability and the Inventory of Factors S T D C R were administered, scored, and interpreted according to the directions in the manuals (**4, 5**).

The Rorschach Ink-blot Test. This test consists of a standard series of ten ink-blot pictures which serve as the stimulus material for the subjects. They are reproduced on cards 7 by 9.5 inches, the cards being numbered from I to X. The ink-blots are in black, white, and gray with some color in cards II and III, and cards VIII, IX, and X are entirely colored.

In the administration of this test the examiner sat beside the subject, where both could see the card, but far enough removed from him so that it was impossible for him to see what the examiner wrote. The examiner prefaced the test with such remarks as: "You have probably seen pictures in clouds, have you not? I am going to show you a series of ink-blots, and will you tell me what you see in them? First, you look at the blot right side up, then turn it to the right, then upside down, then to the right again. In that way you will have viewed it from all four sides."

There was no time limit for responses. Each response was written and numbered for each ink-blot. Positions of the card were recorded by "V" in different positions. If the area used by the subject was reasonably clear, the examiner marked it on the Location Chart by drawing a line around the response area and marking this line with the corresponding number of the response. The Location Chart consists of the ten ink-blots in miniature in tones of gray.

After the original responses were recorded, inquiry about determinants was made. Leading questions were avoided. The most usual was: "What in the blot made you think of . . . ?"

An attempt was made to score the results of these interviews by means of methods similar to those used by Klopfer and Kelley (**9**). Scoring was done in terms of three categories to answer the questions:

1. Where does the subject see what he sees?
2. How does he see what he sees, or what elements other than location determine the formation of the concept?
3. What content is in the response?

The Thematic Apperception Test. For this test the subject is seated in a chair located so that he cannot see what the examiner writes. The test is

prefaced by remarks from the examiner: "I am going to show you some pictures. About each one you are to tell what led up to the situation shown in the picture. Then tell what is happening now, how the people feel, and how the story will end. You are to use your imagination as much as possible."

In this investigation the principal intent has been to determine the dynamic content of the stories and to analyze them for expression of the basic needs of the leading character, his reactions to frustrations, his attitudes towards his environment, the adequacy of the central character, and how the story ends. Murray and his assistants have assumed that from the needs and situations shown in the fantasies one can infer that the story-teller has projected his own strivings and attitudes into the characters of the story. The hero is assumed to be the story-teller himself. The forces acting upon the hero may be reflections of the way the teller perceives and imagines his environment. The manner in which the hero solves his conflicts is purported to reveal the subject's desires or attitudes toward resolving his own problems.

In classifying the needs of the principal character, the categories used in this study include five of the six listed by Travis and Baruch (**16**): achievement, affection, belongingness, recognition, and sensory gratification. The need for response which they listed has been included under need for recognition in this study.

In many of the fantasies there was indication that the leading character was struggling with obstacles of both a physical and psychological nature. He manifested various types of behavior when he was frustrated. These reactions have been categorized under the following terms: abasement, aggression, ambivalence, anxiety, compensation, conversion, escape, fear, identification, insanity, introjection, rationalization, reaction, formation, regression, repression, and sublimation.

Murray includes needs under the term "thema." "To state a 'thema' means to state the press or situation to which a person is exposed and the way he reacts to it" (**17**, 16). Murray's concept of the "thema" includes a variety of categories which are readily reducible to fewer terms. The most significant ones included in this study are: abasement, achievement, acquisition, affiliation, aggression, autonomy, blamavoidance, blamescape, deference, dominance, excitance, exhibition, harmavoidance, inviolacy, nurturance, nutriance, passivity, play, recognition, rejection, seclusion, sentience, sex and succorance.

Murray's notion of "attitude towards parents and siblings" has been broadened in this research to include attitudes of the individual toward society as well. This was done because the present study involved adults. These attitudes pertain to such forces of the environment as: (a) the environment dominates, (b) it is friendless, (c) harmful, (d) helpful, (e) loving, (f) monotonous, (g) mysterious, (h) it punishes, (i) recognizes, (j) it is submissive and allows the hero an opportunity to control it, (k) it is thwarting, (l) it is undesirable and is rejected by the hero, and (m) it requires that one work in order to achieve desirable results in life.

The adequacy of the principal character is one of the analyses made by Murray. This analysis is also made in this study. It is important to discern whether the hero is competent or not. Usually there is a consistency which indicates a certain helplessness or self-sufficiency of the individual telling the stories.

Endings may be satisfactory for the hero or they may end in futility. Sometimes society does not approve of behavior that might be entirely satisfactory to the hero in the story. For example, a story ending in suicide might be very satisfactory to the hero, but society does not condone it. Thus the ending would be classed as unsatisfactory.

These tests were administered and analyzed independently of any knowledge of clinical histories of the subjects so that the interpretations would be unbiased by previous knowledge. At the same time the tests were being given by the experimenter, members of an advanced clinical psychology class were interviewing some of the stutterers individually. Each class member was

assigned a stutterer. At the end of five months the case studies of some ten or twelve of the stutterers were compared with data obtained from the personality tests. There was considerable agreement in the findings of the two approaches.

IV. Results

The results of this study have been considered from a quantitative viewpoint insofar as the tests would permit. Since the tests used differ so greatly, the use of a common statistical method of interpreting the results was not feasible. The questionnaire (Inventory of Factors S T D C R) is amenable to statistical treatment by the method of averages. This method, as well as comparisons of proportions of responses, has also been used with the Rorschach test results. Proportions have been used in interpreting the Thematic Apperception Test findings statistically.

TABLE I. Mean Raw Scores, Standard Deviations and Critical Ratios for Stutterers and Non-Stutterers on an Inventory of Factors of S T D C R (Social Introversion, Thinking Introversion, Depression, Cycloid Tendencies, Rhathymia or Happy-go-Lucky Attitudes).

	Stutterers		Non-stutterers		CRmean
	Mean	SD	Mean	SD	
S	28.53	12.30	20.53	9.42	2.79
T	38.53	9.83	35.73	10.35	1.05
D	28.80	14.01	20.40	11.48	2.49
C	31.87	13.79	26.47	12.94	1.53
R	30.47	11.92	40.47	11.87	3.21

The stuttering and control groups were compared on the basis of the results of the three personality tests. On the Inventory of Factors S T D C R there were significant differences in factors S, D and R as indicated by the critical ratios in Table I. The stutterers were more socially introvertive, more depressed, and less happy-go-lucky than the non-stutterers. With respect to thinking introversion and cycloid tendencies the two groups were not differentiated.

The Rorschach test results were not entirely amenable to statistical treatment. There were no significant differences in terms of the means in any of the categories. The stutterers were more variable in the dispersion of their responses to large details (D), small details (d), tiny details (Dd), movement (M), form (F) and in the total number of responses. In proportion of responses on the Rorschach Test the only significant difference found was in the instance, Table II, where there were no movement (M) and no color (C) responses. The stutterers' failure to see movement in the blots indicates that they tended not to recognize their inner promptings. Their not responding to the color in the blots implies a failure to respond impulsively to outside environment.

In the Thematic Apperception Test results there were no

significant differences between the groups in the proportions of needs, reactions to frustrations, themas, attitudes toward environment, adequacy of the central character, and satisfactory or unsatisfactory endings. Both groups had greater needs for achievement and affection than for belongingness, recognition, or sensory gratification. When frustrated, both groups tended to show guilt feelings as indicated by self-punishment (abasement), and to show also aggression and withdrawing tendencies (escape). The most prominent themas for both the stutterers and the control group were achievement, abasement and aggres-

TABLE II. PERCENTAGE OF STUTTERERS AND NON-STUTTERERS RESPONDING TO MEASURES OF INTERIORITY AND EXTERIORITY ON THE RORSCHACH TEST.

	Percentage of Stutterers	Percentage of Non-stutterers	Difference	CR
No M or C	23.3	6.6	8.9	2.8
M − C ≦ 1	0.0	6.6	0.0	0.0
C > M	13.3	23.3	9.9	1.0
M = C	10.0	3.3	6.3	1.1
M > C	53.3	60.1	13.9	0.48

sion. The stutterers' environment, in order of importance, was more thwarting, punishing and dominating while the non-stutterers' environment was almost equally submissive and thwarting, and also undesirable and punishing. The leading characters in the stutterers' stories were adequate 40 per cent of the time as compared with 51 per cent for the control group. However, there were no significant differences in this category nor in satisfactory endings.

The findings from the Inventory of Factors S T D C R are in agreement with some of Johnson's (**8**) findings on the Woodworth-House Mental Hygiene Inventory. He found, as was indicated also by this study, that stutterers tend toward shyness and depression. Bender's (**2, 3**) study of college male stutterers is in agreement with the present study in indicating that stutterers are more introverted than non-stutterers.

The facts that there were no significant differences in the Rorschach test results except in dispersion and a lack of M (movement) and C (color) responses, and that no differences appeared in the case of the Thematic Apperception Test, are incompatible with the findings from the Inventory of Factors S T D C R. This perhaps can be accounted for in several ways. Both the Rorschach and Thematic Apperception tests are designed for individual rather than for group analysis. Psychoneurotic tendencies on the Rorschach are better discovered in each individual case as the test is given. Many of these tendencies are not measurable quantitatively on a group basis. For example, it is difficult to measure refusal of cards, delays in responses, decline in the number of responses to the color cards, and exclama-

tions about the color in the blots, so far as a group study is concerned. These nuances are important in connection with the interpretation of individual results but are lost in the process of quantitative analysis of group results.

V. Summary and Conclusion

Personality differences between 30 adult stutterers, 22 men and 8 women, and a group of non-stutterers were investigated. The groups were matched for decile rating on the Henmon-Nelson Tests of Mental Ability, Form A, age, sex, and college experience. The personality tests used were a questionnaire, an Inventory of Factors S T D C R, and two projective-type personality tests, the Rorschach ink-blot test and the Thematic Apperception Test.

The tests were administered and analyzed independently of any knowledge of clinical histories of the subjects so that interpretations would be unbiased by previous knowledge.

In the Inventory of Factors S T D C R there were significant differences in factors S, D, and R. The stutterers were more socially introvertive, more depressed and less happy-go-lucky than the non-stutterers.

In the proportion of responses on the Rorschach ink-blot test the only significant difference found was in the instance where there were no movement (M) and no color (C) responses. The stutterers' failure to see movement in the blots indicates that they tended not to recognize their inner promptings. Their not responding to the color in the blots implies a failure to respond impulsively to outside environment.

In the Thematic Apperception Test results there were no significant differences between the groups in the proportions of needs, reactions to frustrations, themas, attitudes toward environment, adequacy of the central character, and satisfactory or unsatisfactory endings.

From a clinical standpoint, projective tests are widely regarded as valuable instruments for detecting individual anxieties, constrictions, infantile emotional reactions, and lack of inner and outer control (Rorschach test); and for discovering basic needs, frustrations, attitudes toward the family or environment in general, and autobiographical material (Thematic Apperception Test). The qualitative analyses afforded by such tests are helpful in speech correction for stutterers insofar as they furnish an indication of the general stage of personality development at the time they are given, and also reveal apparent underlying mechanisms of personality which perhaps are not observable by means of other diagnostic tools. Their purpose is not to take the place of objective tests or other clinical methods, but to supplement and clarify data obtained by other means. It is to be recognized, of course, that until further research is done on the Rorschach and the Thematic Apperception tests, their value for group studies is limited because of their many unmeasurable qualitative aspects.

Their chief value lies in their possible uses for purposes of individual case study where the interdependence and patterning of factors have meaning.

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STUDIES IN THE PSYCHOLOGY OF STUTTERING: XIX.

The Relationship Between Oral Reading Rate and Severity of Stuttering*

OLIVER N. BLOODSTEIN, M.A.
University of Iowa

I. Introduction

The object of this study was to determine the rate of oral reading of stutterers, and to investigate the relationship between this rate and severity of stuttering.

Observations have frequently been made concerning the speaking rates of individual stutterers. In this connection Travis (**16**) says, "The stutterer displays great effort in sound production, and certain individuals prolong to a remarkable extent each single vocalization." Van Riper (**17**) notes, however, that stutterers occasionally employ "very rapid speech" as a means of lessening the fear of stuttering on an approaching word.

Little systematic, normative investigation has been attempted, however, of the speaking or oral reading rates of stutterers as a group. The nearest previous approach to such a contribution has been made by Donohue (**2**) who found an average oral reading rate of 82.5 words per minute for ten stutterers reading non-fictional material. It is to be noted, however, that in her study each subject was instructed to read orally for a three-hour period, and after the first several minutes there seemed to be a tendency to "settle down" and "take it easy."

Shaw (**13**) found that the average time required by twenty stutterers to read one short sentence was thirteen per cent greater than the time required by an equal number of non-stutterers. He also concluded that stutterers "show a greater amount of variability than do normal speakers."

Previous studies which have dealt in part with the relation of reading rate to severity of stuttering were experiments concerned with the effect upon stuttering of imposed patterns of speech. They, therefore, are not directly related to the present study, which concerns the relationship existing normally between stuttering and rate. As a matter of interest, however, the relevant data of one of these studies might be noted. Johnson and Rosen (**6**) found that in slow reading stuttering occurred on an average of 1.3 per cent of the words. This compared favorably with three normal, or control, readings in which stuttering was recorded on 7.6 per cent, 3.8 per cent and 3.5 per cent of the words, in that order, at successive stages of the experiment. Slow reading compared unfavorably with other types of speech patterns or conditions, such as reading in chorus with another person and in time to an arm-swing rhythm, which reduced stuttering to an average of 0.01 per cent and 0.1 per cent of the words, respectively. Fast reading raised the incidence of stuttering to 7.7 per cent of the words. This was the greatest frequency of stuttering recorded in the study, and stood in sharp contrast to the frequencies associated with the other changes in speech pattern, which were uniformly low.

A previous study by Darley (**1**) has provided normative data concerning oral reading rate for a group of 200 State University of Iowa students. When a comparison between stutterers and normal speakers has been required, the findings of the present study have been compared with those of Darley.

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*This study was done as a Master's thesis at the University of Iowa and was directed by Wendell Johnson.

II. Problem

Specifically, this study was designed to yield data relevant to the following questions: (1) How do stutterers compare with normal-speaking individuals with respect to oral reading rate? (2) What degree of relationship exists between oral reading rate and the frequency and duration of stutterings?

In considering a method of approach to these problems, it was originally intended to regard oral reading rate in the usual sense of number of words read over total reading time. It appeared, however, that reading rate might also be measured in terms of number of words read over total reading time minus the time occupied in stuttering. By this method a measure of the rate of the stutterer's "free speech" is obtained. It might be objected that in addition to overt blocks, the stutterer's speech is subject to more or less continual difficulty not readily perceptible to an observer, and that the expression "rate of free speech" is thus inaccurate. On the other hand, it was felt that while the data obtained by measuring rate with this method could not be so interpreted as to yield conclusive information concerning the rate of the stutterer's so-called "free speech," at least they would indicate the manner in which severity of stuttering, as measured, is related to reading rate during intervals in which no stuttering is observable. For this reason it was decided to use both methods of measuring rate.

III. Subjects

Thirty stutterers, ranging in age from 17 to 42 years, with an average age of 24 years, served as subjects for this study. Twenty-seven were males and three were females. With the exception of one subject, all were receiving or had received remedial speech instruction. Eighteen were enrolled at the speech clinic of the State University of Iowa, and eight were attending the speech clinic at Northwestern University.[1] The rest were recruited from among the students, graduate assistants and faculty members of the State University of Iowa.

As has been stated, the findings of Darley (**1**) have been used for comparison with those of the present study. The similarity between Darley's subjects and those used in the present investigation is, therefore, of interest. Of the 200 university students used by Darley, 120 were male and 80 were female; 174 were freshmen, 18 were sophomores, four were juniors, three were seniors, and one was unclassified. It will be observed that Darley's subjects contained a large percentage of freshmen, as compared with the other classifications. In the present study, 10 subjects were at the freshman level. The remaining 20 were all above the freshman level. The difference between the stutterers and the non-

[1]The writer is indebted to Dr. Clarence T. Simon and others at Northwestern University for their cooperation and assistance in obtaining subjects at that university.

stutterers in the proportion of male to female should also be noted.

IV. Methods and Procedure

Each subject read three 300-word passages of factual prose. One of these passages was composed predominantly of polysyllabic words, one was composed entirely of monosyllabic words, and one had been carefully constructed to meet the requirements of "average" factual prose.[2] The polysyllabic passage had a total of 660 syllables and a mean word length of 2.2 syllables. The average passage had a total of 440 syllables and a mean word length of 1.5 syllables. The monosyllabic passage had a total number of 300 syllables and a mean word length of one syllable. Each 300-word passage was preceded by an introductory paragraph of two sentences of which no record was made. Since this reading material was identical with that constructed and used by Darley (**1**), his results served as control data for the present study. Accordingly, the conditions of the study were made to duplicate those of Darley's as far as possible. The subject read each passage silently before reading it aloud. Each subject stood as he read. No subject listened to the reading of any other subject. The six possible orders in which the passages could be given were rotated regularly. Except for minor alterations, the instructions read to each subject were identical with those read to Darley's subjects.

The writer and another observer made independent records of the reading time and stutterings of each subject on a constant speed polygraph on which were mounted two pens. Each observer operated a noiseless mercury key which was connected to its corresponding pen. When a key was depressed, one of the pens was deflected slightly to one side, and the line it traced on the paper was correspondingly displaced. When the key was released the pen returned to its original position. Each observer depressed his key when he thought a block in the subject's speech had been initiated, and released the key at the termination of the block. In this way, there was produced in the line a depression which represented the duration of the block. The beginning and end of the reading were also recorded by both observers on the polygraph. Shortly before the reading began, both observers depressed their keys. The writer then set the polygraph paper in motion, and instructed the subject to begin reading. When the subject reached the beginning of the 300-word passage to be recorded, the observers released their keys. This produced an indentation in the line which indicated the beginning of the reading, and at the same time placed the pens in position to mark the first block. At the end of the reading the keys were depressed and held down until the polygraph was stopped. All movements made by each observer in manipulating the keys were screened from the other observer and from the subject. The polygraph itself was hidden from view.

Only those blocks on the occurrence of which both observers agreed were measured. Deflections transmitted by only one key were discarded. When two deflections of one pen fell opposite one deflection of the other, they were regarded as one deflection, and the distance from the beginning of the first deflection to the end of the second was measured as one block. In recording the duration of each agreed block, the judgments of the two observers were averaged.

By this method a record was obtained of the rate of the reading of monosyllabic, polysyllabic and average material by each subject, and of the frequency and duration of stuttering in each case. For purposes of reliability, fifteen subjects repeated their performance after an interval of several days.

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[2] These passages were constructed by Frederic Darley. The "average" passage appears in Fairbanks' *Voice and Articulation Drillbook* (**3**). All three passages were used by Darley (**1**) in his study of the oral reading rates of normal speakers. The reading passages, together with detailed tabulations of the data obtained in the present study, are contained in the appendix of the manuscript copy of this report which in on file in the Library of the State University of Iowa.

The polygraph paper ran at a constant speed of 32 mm. per second.[3] Each deflection of the line was measured to the nearest millimeter, or .03 of a second. The length of each block in millimeters was subsequently converted into duration in seconds, and the entire length of the record in millimeters was converted into total reading time in seconds. From these measures were computed the total duration of stuttering, mean duration of stutterings, frequency of stuttering and reading rate in words per minute. In computing the rate of "free speech," the total duration of stuttering was subtracted from the total time consumed by the reading, and the resulting measure was treated as the non-stuttered reading time.

V. Reliability

Since all blocks not marked by both observers were discarded, the data used in computing the measures of stuttering may be said to have perfect reliability. It is of some interest, however, to note to what extent the two observers agreed in reporting the occurrence of blocks. The total number of agreements was 3,202. The discarded blocks, those observed by one observer but not by the other, numbered 1,092. A percentage of agreement of 74.6 is obtained from these figures. A more refined method of stating the agreement is represented by the formula $\frac{c}{\sqrt{xy}}$ in which c represents the total number of agreements, x the total number of blocks marked by 0_1 and y the total number of blocks marked by 0_2. The coefficient of agreement thus computed was .87.

As stated above, the duration of each stuttering block was represented by the average of the two observers' judgments of the duration. For the purpose of determining the reliability of these data, a Pearson product-moment correlation was run, using 306 pairs of judgments of duration obtained from a random sample of nine records. A coefficient of correlation of .95 was obtained, indicating close agreement between the observers in judgments of duration.

For the purpose of determining the reliability of the data, the readings of fifteen subjects were repeated. In each case, an interval of several days elapsed between the first and second readings. The difference found between the means of the measures of over-all rate in reading I and reading II for the three passages were not statistically significant. The rates recorded in the first and second readings correlated highly for the monosyllabic, average and polysyllabic passages, the Pearson *r*'s being .88 ± .04, .75 ± .08 and .83 ± .06, respectively.

VI. Results

The results are presented in Tables I and III. For purposes of comparison, Darley's (1) findings for non-stutterers are shown in Table II. Correlations between various measures are listed in Table III. Significance ratios with regard to differences in means between specified measures of rate are shown in Table IV.

[3] In recording the blocks of eight subjects at Northwestern University, the polygraph was set at a constant speed of 15 mm. per second.

TABLE I. MEASURES OF SEVERITY OF STUTTERING FOR THIRTY SUBJECTS READING FACTUAL MATERIAL

Monosyllabic	Average	Polysyllabic

TABLE I. MEASURES OF SEVERITY OF STUTTERING FOR THIRTY SUBJECTS READING FACTUAL MATERIAL

	Monosyllabic			Average			Polysyllabic		
	Percentage of Words Stuttered	Mean Duration of Stutterings	S. D. of the Durations	Percentage of Words Stuttered	Mean Duration of Stutterings	S. D. of the Durations	Percentage of Words Stuttered	Mean Duration of Stutterings	S. D. of the Durations
Range	0.0–45.3	0.0–3.4	0.0–2.5	0.0–47.0	0.0–3.7	0.0–9.1	.3–68.3	.2–2.2	0.0–2.8
Median	3.0	.7	.3	6.7	.9	.6	8.3	.9	.6
Mean	8.8	.8	.5	10.8	1.1	1.0	16.2	1.0	.7
S. D.	11.7	.7	.5	12.6	.9	1.6	17.7	.5	.6
Q_1	1.1	.3	0.0	1.3	.5	.2	2.3	.6	.2
Q_3	9.9	.9	.6	11.9	1.4	1.1	21.1	1.2	.9
Q	4.4	.3	.3	5.3	.4	.4	9.4	.3	.3

TABLE III. MEASURES OF ORAL READING RATE OF 30 STUTTERERS READING FACTUAL MATERIAL

	Monsyllabic		Average		Polysyllabic	
	Over-All Rate	Non-Stuttering Rate	Over-All Rate	Non-Stuttering Rate	Over-All Rate	Non-Stuttering Rate
Range	52.4–241.6	109.0–241.6	42.4–191.3	89.2–191.3	28.6–141.2	63.3–164.1
Median	160.7	173.3	133.4	146.1	87.2	103.0
Mean	150.3	170.3	122.7	144.7	85.1	104.5
S.D.	51.4	35.4	40.3	24.4	28.6	18.9
Q_1	90.6	139.9	88.7	128.6	61.9	93.6
Q_3	182.6	187.7	144.3	155.3	99.0	107.7
Q	46.0	23.9	27.8	13.3	18.5	7.1

Table I summarizes the data relating to the severity of stuttering of the 30 subjects. The "percentage of words stuttered" is computed from the frequency of stuttering in each case, and is based upon the assumption that the subject stuttered on no word more than once. It must be noted, however, that in the case of at least three subjects who were severe stutterers blocks sometimes occurred twice on a single word. It may be said that this error does not affect any of those findings which were based on measures of severity other than percentage of words stuttered.

The stutterers' over-all reading rates were found to be significantly slower than those of Darley's non-stutterers. The non-stuttering rates of the stutterers were significantly faster than their over-all rates, but significantly slower than those of Darley's normal-speaking group. Both the over-all rates and non-stuttering rates were faster for the monosyllabic passage than for the average passage, and faster for the average passage than for the polysyllabic passage. Both measures of reading rate correlated highly with all the measures of stuttering severity except mean duration of stutterings.

TABLE II. MEASURES OF RATE OF ORAL READING OF DARLEY'S (1) 200 NORMAL-SPEAKING SUBJECTS READING FACTUAL MATERIAL.

	Monosyllabic	Average	Polysyllabic
Median Rate	200.2	166.1	114.9
Mean Rate	200.7	167.3	115.2
S. D.	20.6	16.2	11.3
Range	153–257	129–222	88–146

Table III shows the measures of oral reading rate of stutterers. It will be seen that the average material, to which the greatest significance is to be attached, was read at an over-all rate of 122.7 words per minute. This is to be compared with a mean rate for Darley's non-stutterers of 167.3 words per minute. As has been stated, the reading rates for the monosyllabic and polysyllabic material were likewise significantly slower for the stutterers than for the non-stutterers. An examination of the S. D.'s in Tables I and III reveals that the stutterers were more variable than were the non-stutterers. This corroborates Shaw's (**13**) finding that stutterers "show a greater amount of variability than do normal speakers" with respect to oral reading time.

In other respects, the performance of the stutterers was similar to that of the non-stutterers, in that the rate of reading of the average passage was significantly slower than that of the monosyllabic passage, and the rate of reading of the polysyllabic passage was slowest of all. As was the case with normal speakers, the stutterers varied most widely in reading monosyllabic material, and least widely in reading polysyllabic material.

The mean non-stuttering rate for the reading of average material was 144.7 words per minute. This rate is significantly faster than the over-all rate for stutterers of 122.7 words per

minute, but significantly slower than the rate for normal speakers of 167.3 words per minute. This general relationship between the groups is also exhibited by the rates for the reading of the monosyllabic and polysyllabic passages.

Monosyllabic and polysyllabic material produced the same effect upon the means and variability of the non-stuttering rates as upon those of the over-all rates.

All differences cited above between the various measures of rate were statistically significant. The significance ratios are shown in Table IV.

TABLE IV. SIGNIFICANCE RATIOS WITH REGARD TO DIFFERENCES IN MEANS BETWEEN SPECIFIED MEASURES OF ORAL READING RATE OF STUTTERERS AND DARLEY'S (1) NON-STUTTERERS.

Measures	Significance Ratios
Stutterers' over-all rates for monsyllabic passage and non-stutterers' rates for monosyllabic passage	5.3
Stutterers' over-all rates for average passage and non-stutterers' rates for average passage	5.9
Stutterers' over-all rates for polysyllabic passage and non-stutterers' rates for polysyllabic passage	5.7
Stutterers' non-stuttering rates for monosyllabic passage and non-stutterers' rates for a monosyllabic passage	4.6
Stutterers' non-stuttering rates for average passage and non-stutterers' rates for average passage	4.8
Stutterers' non-stuttering rates for polysyllabic passage and non-stutterers' rates for polysyllabic passage	3.0
Stutterers' over-all rates for average passage and stutterers' over-all rates for monosyllabic passage	6.1
Stutterers' over-all rates for average passage and stutterers' over-all rates for polysyllabic passage	12.5

The relations among the various measures of stuttering, between the over-all and non-stuttering reading rates, and between reading rate and severity of stuttering, as variously measured, are summarized in Table V. Frequency and total duration of stuttering are highly correlated (r, .95). Mean duration of stutterings, however, is not correlated to any considerable degree

TABLE V. COEFFICIENTS OF CORRELATION BETWEEN VARIOUS MEASURES OF ORAL READING RATE AND SEVERITY OF STUTTERING OF 30 STUTTERERS READING "AVERAGE" FACTUAL MATERIAL.

Measures	r
Frequency of stuttering and mean duration of stutterings	$.17 \pm .12$
Frequency of stuttering and total duration of stuttering	$.95 \pm .01$
Total duration of stuttering and mean duration of stutterings	$.38 \pm .11$
Over-all rate and non-stuttering rate	$.88 \pm .03$
Over-all rate and frequency of stuttering	$-.88 \pm .03$
Over-all rate and mean duration of stutterings	$-.46 \pm .10$
Over-all rate and total duration of stuttering	$-.85 \pm .03$
Non-stuttering rate and frequency of stuttering	$-.77 \pm .05$
Non-stuttering rate and mean duration of stutterings	$-.33 \pm .11$
Non-stuttering rate and total duration of stuttering	$-.72 \pm .06$

with frequency of stuttering (r, .17), nor with total duration of stuttering (r, .38). In other words, a stutterer whose blocks are relatively long does not necessarily stutter with relatively great frequency. This confirms the finding of Johnson and Colley (**5**), who reported no difference in amount of stuttering following long as compared with short moments of stuttering.

It is of interest that the over-all rate of oral reading of stutterers correlates highly (r, .88) with their rate of reading during non-stuttering, or fluent, intervals. The significance of this is considerably clarified by the remaining coefficients in Table V, which represent the relationship, as variously defined, between reading rate and severity of stuttering.

In general, these latter coefficients show two things. First, frequency of stuttering and total duration of stuttering are highly correlated, negatively, not only with the over-all rate as would probably be expected, but also—and to only a slightly less marked degree—with the non-stuttering rate. Second, mean duration of stutterings is not highly correlated with rate, whether computed in over-all terms (r, $-.46$) or for only the fluent periods (r, $-.33$). The limited range of durations, with slightly less than 25 per cent of the moments of stuttering exceeding 1 sec. in duration, probably accounts in the main for the relatively low correlations in which mean duration is involved. It is to be considered that stutterers who differ greatly in frequency of stuttering, and therefore in total stuttered time (the correlation between these measures is .95), do not necessarily differ to any appreciable extent with respect to the average duration of their individual stutterings. In general, a moment of stuttering lasts about as long when performed by one stutterer as when performed by another. Reading rate, then, does not tend to vary a great deal from one stutterer to another by reason specifically of this factor of the duration of the individual moments of stuttering.

Reading rate does vary significantly, however, in relation to frequency—and so, to total duration—of stuttering. That this is found to be true so far as the over-all rate is concerned is probably little more than a confirmation of the obvious. That it is found to be true with respect to the stutterer's reading rate during the intervals when he is presumably not stuttering is something else again. Possible explanations will be examined in the concluding section of this paper.

VII. Summary

Thirty stutterers attending the State University of Iowa and Northwestern University speech clinics each read three 300-word passages of factual prose. One passage was composed entirely of monosyllabic words, one was composed predominantly of polysyllabic words, and one had an "average" word length for factual prose. These passages had been constructed and used by Darley (**1**) in his study of the oral reading rates of 200 normal

speakers. Darley's study thus provided data for comparison with that obtained from stutterers.

The reading time, and the occurrence and duration of blocks were recorded independently by two observers who operated signal keys attached to pens mounted on a constant speed polygraph. Only those blocks which were marked by both observers were used in the analysis of data. The agreement of the observers in judging the duration of blocks is indicated by a Pearson *r* of .95. Reliability of the reading rate data, determined by means of two readings several days apart by each of 15 stutterers, is reasonably high, as shown by Pearson *r*'s of .88, .75 and .83 for the monosyllabic, average and polysyllabic passages, respectively.

The aims of the study were (1) to investigate the over-all and non-stuttering (fluent interval) oral reading rates of stutterers; (2) to compare these rates with the oral reading rates of non-stutterers, as reported by Darley (**1**); and (3) to discover the degree of relationship existing between these measures of rate and various measures of severity of stuttering.

Stutterers were found to read average factual prose at a mean rate of 122.7 words per minute, as compared with a mean reading rate of 167.3 words per minute for non-stutterers, as determined by Darley. The S.D.'s of the distributions of rates for all passages were found to be greater for stutterers than for non-stutterers. As in the case of the non-stutterers, the stutterers read the average passage at a considerably slower rate than the monosyllabic passage, and the polysyllabic passage at a considerably slower rate than the average passage. The stutterers, like the non-stutterers, varied most widely in reading the monosyllabic passage, and least widely in reading the polysyllabic passage.

The mean non-stuttering fluent interval rate for the average passage was 144.7 words per minute. This was significantly faster than the mean over-all rate for stutterers, but significantly slower than the mean oral reading rate for non-stutterers.

High negative correlations were obtained between over-all reading rate and both frequency and total duration of stuttering. There was also a high negative correlation between these measures of severity and non-stuttering rate. A low negative correlation was obtained between mean duration of stuttering and both measures of rate.

Frequency and total duration of stuttering correlated highly, but a low correlation was obtained between each of these measures and mean duration of stutterings.

The two measures of reading rate correlated highly with each other.

VIII. Conclusions

The outstanding results of this study were the findings that the non-stuttering (fluent interval) reading rates of the stutterers were significantly slower than the oral reading rates of Darley's

normal speakers, and that the non-stuttering reading rate was highly correlated, negatively, with both frequency of stuttering and total duration of stuttering. There are a number of possible explanations.

A subtle psychological difference in the experimental conditions for the two groups may have been produced by a tendency on the part of the stutterers to evaluate the reading situation as a test of speech adequacy, a test in which they were accustomed to "fail." The possible resulting attitude of generalized anxiety and extreme caution might have accounted for a slowing down of the reading rate.

Another possible explanation is that many of the blocks disregarded because they were not recorded as blocks by both observers, nevertheless may have corresponded to some phenomenon of the general nature of non-fluency which would have retarded the subjects' reading rate. It is also to be noted that each observer reported instances in which he was aware of a diffuse nonfluent quality of the reading which he literally could not "put his finger on."

A more likely and significant explanation, however, can be made. It is to be considered that such studies as those of Kimmell (**9**), Johnson and Solomon (**8**), and Johnson and Ainsworth (**4**) strongly indicate that the speech of stutterers is characterized in a general sense by "anxious" anticipation of stuttering, which might reasonably be expected to retard the speaking and reading rates. It might reasonably be assumed that a stutterer not only tends to proceed cautiously, as it were, but also, and particularly, that he slows down and sometimes even stops in anticipation of difficulty on a given word. This explanation of the relatively slow non-stuttering reading rate would appear more reasonable, on the basis of all that is known about stutterers, than would the assumption that the slowness of rate is to be attributed to some "neuromuscular instability," for example, particularly in view of the finding of Strother and Kriegman (**15**) that stutterers and non-stutterers do not differ in diadochokinetic rate of lips, tongue and jaw. The principle of economy would appear to favor the former of these two hypotheses. What is particularly crucial is that the explanation here presented would appear to be concordant with the high negative correlation between the non-stuttering reading rate and frequency of stuttering (r, $-.77$) and total duration of stuttering (r, $-.72$), respectively. The explanation would appear to be that, since stutterings tend to be preceded by anticipatory anxiety reactions which are expressed in part by a decrease in rate of reading as the feared word is approached, the more frequently stuttering occurs the greater the proportion of the words that are read at the decreased rate occasioned by the anticipatory state preceding stutterings. The consistency with which stutterings are anticipated is relatively great, according to investigations of this problem reported by

Johnson and Sinn (**7**), Knott, Johnson and Webster (**10**) and Van Riper and Milisen (**18**). It is great enough in all probability to lend credence to the explanation here given of the relatively slow non-stuttering reading rate of stutterers, the high negative correlation between the non-stuttering reading rate and frequency of stuttering, and the relation between these two findings that is here postulated.

The difference in the proportion of males to females, is apparently not an important consideration, since Darley found that the difference in the mean reading rates of males and females was not statistically significant. Likewise, the hypothesis that a possible, although unchecked, slower silent reading rate on the part of the stutterers may account for their retarded rate of oral reading during "free speech" is probably untenable, since Darley (**1**) found a low correlation between oral and silent reading rates of non-stutterers, and, moreover, Moser (**11**) found that during oral reading of stutterers, the abnormalities of eye movement are associated mainly with the stuttering blocks themselves.

A second finding which is worthy of note is the low correlation found, in this study, between mean duration of stutterings and other measures of stuttering severity. Johnson and Colley (**5**) reported a correlation coefficient of .54 between mean frequency and mean duration of moments of stuttering in 50-word segments of a 1,000-word passage read by twenty subjects. They found a mean rank-order correlation of .33 between these measures, with the range of the individual *rhos* for the 20 subjects extending from $-.17$ to $+.87$. In the present study, a correlation of these two measures for each subject yielded a coefficient of only .17. The relative inflexibility, or restricted range, of the measure of mean duration as indicated by the distribution (75 per cent of the means were 0.9 sec. or less) probably accounts for its low correlation with the other two measures. Stutterers in general simply do not vary a great deal and do not show marked individual differences with respect to the mean durations of their individual moments of stuttering. The possibility may remain in some degree, however, that the measure of mean duration of stutterings represents an aspect of the severity of stuttering that is basically different from that which is measured in terms of either total duration of stuttering or frequency of stuttering. Insofar as this may be true, it would be advisable in any investigation of severity of stuttering to use the measure of duration of individual moments in addition to one or both of the other two measures indicated. It is to be noted that the other two measures correlated very highly in the present study, the Pearson *r* being .95, and that they might well be considered, for many purposes, as being essentially equivalent. The point is, of course, that since moments of stuttering do not vary greatly nor differ markedly from one stutterer to another, so far as duration is concerned, the factor that mainly determines the total stuttered time in the course of

a reading or speaking performance is not the mean duration but the sheer number of stutterings that occur.

A more complete knowledge of the difference between stutterers and non-stutterers with respect to oral reading rate, and of the relation of oral reading rate to severity of stuttering, is to be obtained from further studies of the effect upon rate of varying conditions. In this connection it is of interest that Donohue (**2**) found a considerably slower rate of oral reading for stutterers than was found in the present study. Her subjects, however, read continuously for three hours, and there was an indication that the relative slowness in rate was reflective of the subjects' psychological reaction to the prospect of a long period of reading. This is suggested, not only by the non-quantitative observations of the experimenter, but also by the mean reading rates as reported for the first, second and third hour, which were, respectively, 82.5, 66.0, 68.0 words per minute. One cannot be sure whether non-stutterers would react differently to a similar oral reading assignment.

It is of further interest that, in spite of this tendency of Donohue's subjects to reduce their reading rate as they settled down to the task of reading for three consecutive hours, they stuttered with decreasing frequency as they progressed with the reading. This would indicate that the relation between severity of stuttering and rate of reading, and probably of speaking, is not a simple one.

The problem of reading rate is also complicated by considerations of the nature of the reading situation. Porter (**12**) found that stutterers stutter with increasing frequency as the size of the audience is increased, and she also found, as did Steer and Johnson (**14**), that stutterers present different frequencies of stuttering in reading to different individuals. Such findings suggest that psychological factors, such as those associated with the personnel and size of audience, and doubtless other psychological factors as well, are to be evaluated in relation to reading rate, and with reference to the relation between reading rate and severity of stuttering.

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ASCA
News and Announcements

MIRIAM D. PAULS, *Editor*
Indiana State Teachers College

For the convenience of the members of ASCA, particularly those interested in qualifying for the positions described in the War Notes in this issue of the *Journal*, an effort was made to gather as much information as possible about the summer school offerings in Speech Pathology and Hearing Conservation. The following announcements were received:

The University of Wisconsin is offering the usual opportunities for study in speech correction on both an undergraduate and graduate level. The summer session will be for eight weeks, June 24-August 18. A seminar in Speech Pathology for graduate students will highlight the problems of rehabilitation of the war-injured, including those who have been deafened. An opportunity is afforded the student to work in one or more of the speech clinics in operation during the summer, viz., the teaching clinic of the Department of Speech, or the Cleft Palate Clinic sponsored by the Federal Children's Bureau, the State Department of Public Instruction and the Wisconsin General Hospital.

The University of Iowa Summer Session will provide the usual full curriculum leading to the M.A. and Ph.D. degrees in Speech Pathology. It is also possible now for students to take these degrees with concentration in the field of Hearing Conservation. An intensive four-weeks course in Audiometry and Fitting of Hearing Aids will be given from June 26 to July 22 and a Conference Series on Speech and Hearing Rehabilitation will be conducted each week-end from June 23 to July 22 by Drs. Bryng Bryngelson, Raymond Carhart, Walter Hughson, Herbert Koepp-Baker and Harold Westlake, as was announced in the March issue of the Journal. Miss Jacqueline Keaster will teach courses in lip reading and speech correction for the hard of hearing. The Summer Speech Clinic for children and adults will run from June 19 to July 28.

Emerson College is offering a new course under Prof. Samuel D. Robbins on Rehabilitation of Speech in War Veterans. An advanced course in voice disorders will also be given.

Syracuse University is offering two courses at the advanced undergraduate level, Speech Re-education and Hygiene and Advanced Speech Re-education, with opportunities for clinical experience. In the graduate field The Therapy of Stuttering and Speech Pathology is being offered.

The Brigham Young University will conduct a speech clinic this summer and has invited parents to bring all students within a radius of five hundred miles to this clinic for remedial work. The clinic will run for six weeks and be under the direction of Dr. Alonzo J. Morley. The university is doing some other interesting things. Distance being a major problem in the west, Dr. T. Earl Pardoe is conducting a recording and radio seminar for teachers of all grades so that they will be able to send in recordings from their respective districts when there is no clinic in their vicinity. A clinic will also be conducted in American Forks, so that teachers can be certified under the state law requiring that all teachers of public schools complete a three-hour course in speech correction.

Developments in the program in speech correction and rehabilitation at the University of Denver will continue during the coming summer. Dr. Ernest Henrikson, Director of the Speech Clinic, will present courses in Speech Pathology and Correction, and he will conduct a special laboratory class for stutterers. He will also direct work in speech rehabilitation for returning soldiers in certain Denver hospitals. Mrs. Edna Hill Young, director of the Hill-Young Special Clinic for Children, will work with cases of delayed speech, spasticity and cleft palate at her residence school. Dr. Mildred Freburg Berry, of Rockford College, will be a visiting lecturer and consultant in speech correction during the second summer term.

Parents or teachers, under some limitations, may attend with their children during the summer and receive instruction for follow-up work.

Indiana State Teachers College is offering courses in both Speech and Hearing Therapy during the first summer term, May 29-June 30, on both the undergraduate and graduate level. Anatomy and Physiology of the Ear and Vocal Mechanism, Psycho-Physics of Sound and Audiometric Testing, Lip Reading Theory and Methods, Lip Reading Clinic I, Phonetics, Speech Pathology I, and The Speech Clinic I and II will be given. Wide provision is made for clinical practice with all age levels in the Special Education Clinics. During the first summer term and during the second summer term, July 3-August 4, education and psychology courses will be offered that are necessary to fulfill the state Speech and Hearing Therapy license requirements.

Purdue University is offering the following courses during the summer term: Voice Improvement, Phonetics, Voice Science, Speech Pathology (elementary and advanced), Seminar in Special Problems of Speech and Hearing. The summer term starts July 10.

The University of Michigan is offering a very interesting program this summer in addition to the usual number of beginning courses in speech correction. The Department of Speech and Institute for Human Adjustments are cooperating to feature a clinical program on speech rehabilitation for the accidentally and war injured. There will be a graduate seminar with lectures by members of the clinic staff and by members of the staff from the Schools of Medicine and Dentistry. Laboratory work will consist of participation in the program of rehabilitation at the Clinic. A highly selected group of about fifteen adults will represent the types of disorder which are known to be appearing as a result of war injuries. The program of rehabilitation will be intensive. The group will spend six hours a day at the Clinic, five days a week for the six weeks. The seminar will carry four hours credit. Miss Ann Bunger, Rackham School of Special Education, Michigan State Normal College, will teach a course in speech reading. Mrs. Harriet Dunn, of Pittsburgh, will be the Clinical Supervisor for the summer and teach the course in speech correction for teachers.

Louisiana State University is offering one course in Speech Correction this summer. There will be the usual twelve weeks summer clinic with special emphasis on the Children's Clinic.

Ohio State University is offering two summer courses in Speech Pathology and Hearing Therapy. (1) Visual Hearing Technique, which is planned to assist teachers, clinical psychologists, nurses and medical students to understand better the speech and hearing needs of the deaf and hard of hearing cases referred to them. Clinical and laboratory practice is afforded those interested in the practical application of methods and technical procedures. (2) Speech Disorders Survey, which is designed to serve the needs of students who are concerned solely with minor speech correction problems and are entering the field of special education, college, high school or elementary school teaching. This course is offered the second summer term. Both courses carry five credit hours and include facilities for clinical supervision.

NORTHWESTERN UNIVERSITY is offering a Symposium in Hearing Aids and Residual Hearing in the 1944 summer session as part of a program for teachers, reconstruction aides, supervisors of special education, rehabilitationists, hearing conservationists, nurses, physicians' assistants, commercial personnel, and others interested in hearing and deafness. The symposium includes a series of lectures on backgrounds in speech and hearing,

the nature of hearing aids, industrial considerations, methods for selecting the proper hearing aid, research frontiers, and the effective use of residual hearing. Guest lecturers will be: Miss Margaret Bodycomb, Mr. Howard Carter, Dr. Edmund Prince Fowler, Dr. Walter Hughson, Mr. Joseph B. Kelly, Dr. Lewis E. Medlin, Dr. Scott N. Reger, Dr. S. Richard Silverman, Dr. Stanley Smith Stevens, Dr. Norman Watson, and Mr. Wilbur White. The hearing program is closely related with that of the Speech Re-education Department. Courses in Phonetics, Anatomy and Physiology of the Vocal Mechanism, Principles of Speech Re-education, Clinical and School Procedures in Speech Re-education, Psychology of Speech and a Seminar: Speech Pathology, are available.

The Indiana State Teachers College is now conducting a Hearing Aid Clinic service in cooperation with the Vigo County Medical Association. This service provides the scientific fitting of hearing aids selected from those aids approved by the Council on Physical Therapy of the American Medical Association.

Mrs. Spencer Tracy has been instrumental in the establishment of the John Spencer Tracy Clinic for hard of hearing children of preschool age, at the University of California. Mothers of young deaf children attend lectures given by experts in various related fields. They are informed about the speech of the deaf, methods of teaching hard of hearing children, child psychology, nutrition and child care. The clinic is housed in its own building. The rooms are attractively decorated and include a playroom, nursery, lunchroom, kitchen, office and classrooms, and there is a well equipped playground. Teachers in Dr. Boris Morkovin's classes in Psychology of the Hard of Hearing observe and assist in the training of the children.

The appointment of Raymond H. Greenman as Managing Director of the American Society for the Hard of Hearing has been announced by Warren H. Gardner, Ph.D., of Santa Barbara, Calif., President of the Society.

Mr. Greenman succeeds Miss Betty C. Wright, who is on a three months' leave of absence from the Society to serve with the American Red Cross as consultant in the three army hospitals for the special care of deafened soldiers. Miss Wright will return to the Society in August as Director of Field Service.

Mr. Greenman leaves a war assignment with the American Social Hygiene Association to join the staff of the Hard of Hearing Society. He was formerly Executive Secretary of the Tuberculosis and Health Association of Rochester and Monroe County, New York.

In announcing the appointment of Mr. Greenman, Dr. Gardner stated that "the Society is embarking on a war activity aimed to meet, through the cooperation of its 121 local chapters, the rehabilitation needs of the war deafened soldiers. Other activities of the Society, which this year celebrates its Silver Anniversary, will be continued. These include a deafness prevention program for children and the hearing conservation service for adults."

The spring meeting of the Minnesota Speech Clinicians' Association was held April 4, at Children's Hospital, St. Paul. Dr. N. Logan Leven, Associate Professor of Surgery, University of Minnesota, gave a demonstration and discussion of cleft palate surgery. Dr. Bryng Bryngelson, President of ASCA, gave a talk at the luncheon meeting.

The Minneapolis Public Schools speech correction program is being expanded again after a reduced program in special education. The speech clinicians who had been assigned to classroom teaching during the emergency are now being reassigned to speech correction work. It is anticipated that the entire group will be reassigned by September.

The Indiana Speech Correction Association met in Indianapolis March 25 for a panel discussion and business meeting. Representatives from state and national institutions and associations related to the field of special education considered the responsibilities of speech correction to education in general and to the field of special education in particular. Dr. D. W. Morris presided.

The more widespread recognition of the importance of the speech field is manifested in the establishment of the National Institute for Human Relations in New York City. This Institute gives speech and hearing diagnoses to individuals and companies interested in the applications of speech in salesmanship and human relations. Dr. James F. Bender is now director of the institute.

PERSONALS

Miss Bette Bartell, graduate student in speech pathology at the University of Iowa, is now a speech correctionist in the Rochester, Minnesota, Public Schools.

Two members of the Speech Improvement Department of New York City have joined the WAVES. They are Ensign Margaret E. Young and Ensign Beatrice Drivas.

Miss Mary B. Cardoza, who has been on the Brooklyn College Speech Clinic staff for the past two years, is now director of the evening session speech clinic.

Dr. Arthur Secord, Director of the Speech Clinic at the University of Missouri, accepted a position on the staff of the Speech Department at Brooklyn College on February 1, 1944. Dr. Secord will be a member of the staff of the 1944 summer session at the University of Missouri.

There are now quite a few members of the Association attached to the National Defense Research Council Unit at Waco, Texas. Dr. Paul Moore of Northwestern University is the latest addition. Professors John Wilson Black (Kenyon), Henry Moser (Michigan), James Curtis (Purdue) and Mallory (Temple) are known to be there, too.

Miss Adeline McClelland, formerly speech teacher at the State Teachers College at Slippery Rock, Pennsylvania, left to take a position in speech correction in Dearborn, Michigan. Miss Janet Burns, formerly of State College, Pennsylvania, has taken Miss McClelland's position at Slippery Rock.

Mr. Boyd Sheets, Clinical Fellow, University of Minnesota, is in Florida working in the F.B.I.

Private Joseph M. Wepman is with the Psychological Research Unit No. 11, Buckingham Army Air Field, Fort Myers, Florida.

Mr. and Mrs. Max Reed are completing their Master's degrees at Louisiana State University this summer in speech correction and psychology, respectively. Mr. Reed has accepted a position at Central Institute for the Deaf as an assistant in Speech Correction. He will continue his work on an advanced degree at Central Institute and Washington University.

Dr. Ollie Backus has been acting as Consultant on speech cases at the Percy Jones General Hospital, Battle Creek, Michigan.

Mr. Edward Burt Longerich, former speech instructor at the Northeast Junior College of Louisiana State University, recently accepted a position in the Process Engineering Department of Douglas Aircraft, Long Beach, California. His wife, Dr. Mary Coates Longerich, who also recently served as speech instructor at the university, is now engaged in the private practice of speech correction in Hollywood.

All members of the ASCA who are affiliated with colleges and universities are requested to inform the heads of their libraries that it will be necessary for them to subscribe for the *Journal of Speech Disorders* through the office of the Business Manager, Dr. D. W. Morris, not through a magazine agency. The bound volumes of the *Journal* are now available only to members of the Association.

Journal of Speech Disorders, 1944, **9**, 180-183

ABSTRACTS OF CURRENT ARTICLES

MARY HUBER, *Editor*
Brooklyn College

Cochran, L. A new phonetic discrimination test using words as stimuli, *Speech Abstracts*, 1944, **4**, 37.

An experimental phonetic discrimination test using words as stimuli rather than the nonsense syllables was constructed with the double purpose of attempting to find a device which would yield an estimate of hearing loss, and also prove a value in the diagnosis of the substitution errors of the articulatory defective. The results were analyzed statistically and two tentative conclusions submitted. (1) The phonetic discrimination test using words as stimuli is not a very helpful test of auditory acuity because its results are too much a function of word meaning and the subjects' speech habits. (2) The test is a more valuable diagnostic and therapeutic aid in sound substitution cases than nonsense syllable type phonetic discrimination tests. (*Abstracted by Carl H. Ritzman, Oklahoma.*)

Evans, M. L. An adaptation of the audiometric technique for use with young children, *Speech Abstracts*, 1944, **4**, 20.

The investigator's problem was to determine whether audiometric testing could be adapted for use with children from two to four and one-half years of age. The materials consisted of a 6-A audiometer and a stimulus-reward device consisting of a box containing a brightly colored picture. The picture was not visible until the box was illuminated. The child pressed a push-button to light the lamp inside the box. Each ear of each child was tested at each of the three frequencies, 512, 1024, and 2048 cycles. The child's response was indicated by his pressing the button which illuminated the picture inside the box. A concealed switch kept control of the light in the hands of the tester. As in orthodox procedure the tester could determine the accuracy of response by means of the on-and-off switch on the audiometer. The results of this study would seem to indicate that it is possible to test accurately the hearing acuity of children as young as two and three years of age by means of the audiometer, if adaptations of the audiometer technique are provided so as to hold the child's attention, keep the control in the hands of the tester and not distract attention from the test itself. (*Abstracted by Karl A. Windesheim, Illinois.*)

Goldsand, J. G. Sensory perseveration in stutterers and non-stutterers, *Speech Abstracts*, 1944, **4**, 40.

The purpose of the study was to determine whether increased perseveration is a general characteristic of the stutterer's chemico-neural mechanism. The test involved the time lapse before perception of a dim light after exposure to an intense light. Perseveration time was generally short because of the brief initial exposure to the bright light. The results indicated: (1) Stutterers tend to make higher scores than non-stutterers: (2) Stutterers are almost twice as variable in their responses as non-stutterers.

From this study it would seem that the stutterer is handicapped in the given test (1) by inability to make as rapid shifts in adjustment as the non-stutterer, (2) by the extreme variability of his shifts, even in the same situation. (*Abstracted by A. T. Weaver, Wisconsin.*)

Glicksberg, C. I. Vocabulary and intelligence, *ETC. A Review of General Semantics*, 1943-44, **1**, 92-98.

In terms of concrete educational practice the implications of the thesis advanced in this article are (1) it is advocated that words cannot and should not be studied in isolation. It is believed that our vocabulary expands in conformity with our increasing needs and our widening range of experience and insight. (2) It is urged that experience precedes expression, that our vocabulary grows in geometric progression as the result of our interaction with things and people in our social environment. Hence the object of the schools should be to create a setting of rich and varied and meaningful experiences which will give rise not only to an enlarged vocabulary but to what is more important,

an understanding of fundamental relationships. (3) There is the assumption that the objectives of vocabulary study should not be the accumulation of words and more words. Words are responses to needs, the coin of experience, the medium of understanding and communication. When they do not directly deepen our understanding or facilitate our power of communication, the words we have added to our store constitute so much dead wood; they atrophy for want of use. The supporters of the scientifically graded vocabulary lists argue that these words anticipate future needs. Future needs can be based only upon life experienced in the present and, while it is important to provide intelligently for these needs, it is uncritical and wasteful not to consider the dominant interests, and the out-reaching curiosity of pupils.

The author suggests that further research is urgently needed in the field of vocabulary study. Teachers can make a notable contribution by devising more valid and fruitful methods of teaching pupils to master their language. (*M. H.*)

Gray, G. W. Phonemic microtomy, the minimum duration of perceptible speech sounds, *Speech Monographs*, 1942, **9**, 75-90 and *Speech Abstracts*, 1944, **4**, 53.

In this investigation 11 vowels spoken on 6 voice pitches were presented for any desired duration from several hundredths of a second down to zero. It was found that the minimal duration for perception of the sounds varied with the sounds and the subjects. Recognition was significantly possible on the minimal duration of .24 cycles of the fundamental and seemed to depend upon the proximity of the fundamental to the median voice pitch. Recognition is more ready at lower pitches than at higher. The most unstable vowels seem to be [e] and [ɪ] and there were differences between the recognizability of the vowels spoken by the female or the male voices. In general, the errors of identification lie in that a vowel is usually identified as one adjacent to it in the vowel quadrilateral. (*Abstracted by Robert Curry, Brooklyn College.*)

Hunt, H. F. A practical clinical test for organic brain damage, *J. of Applied Psychol.*, 1943, **27**, 375-386.

This report presents a practical method for the detection of brain damage testing for the presence of concomitant intellectual deterioration. The test by development and validation are given without attempt at any theoretical discussion of the essential nature of deterioration. The test battery consists of 16 tests in the three major divisions: a vocabulary test which is relatively insensitive to brain damage, tests which are sensitive to deterioration and a group of interpolated tests. The first five of the tests constitute a short form of the battery which can be administered in 15 minutes as compared with 30 minutes for the long form. The test battery was administered to 33 patients with a medical diagnosis of organic cerebral damage, chosen by criteria which eliminated most of the seriously deteriorated cases, and to a control group of 41 patients with no diagnosis of organic brain damage. Statistical determination of the discriminating power of the tests was made on selected samples of 25 cases from each group. All of the deterioration tests showed critical ratios between the two groups greater than 6.8. The short form discriminated almost as well as did the long form. The validity of the battery has been confirmed clinically. The battery is appropriate for administration to most patients of either sex with an estimated mental age of 8 or over, who are between the ages of 16 and 70, and have had normal exposure to American culture and the English language. (*Abstracted by William J. Temple, Brooklyn College.*)

Hunter, N. W. The incidence of stuttering in twinning families, *Speech Abstracts*, 1944, **4**, 21.

The investigator's problem was to determine the incidence of stuttering among monozygotic and dizygotic twins. Data on speech defects were secured, through personal interview, on 100 pairs of twins which were classified according to the similarity method. The concordance-discordance method was used as a means of investigating stuttering among twins. There seemed to be a tendency for dizygotic pairs to show a greater incidence of stuttering than monozygotic pairs. There seemed to be a concordance for stuttering among

monozygotic twins and a corresponding discordance for stuttering among dizygotic twins. (*Abstracted by Karl A. Windesheim, Illinois.*)

Jensen, M. B. Reading deficiency as related to cerebral injury and to neurotic behavior, *J. of Applied Psychol.*, 1943, **27**, 535-545.

This author refers to instances of reading deficiency whose primary cause is organic as reading *disability* and to those instances of reading deficiency depending on emotional and intellectual factors as reading *inability*. Reading more nearly involves the entire mental organization than is commonly supposed. Reports available indicate more than average difficulty of delivery at birth. Similarities between reading disability and motor disability resulting from birth injury emphasize the necessity of a rigorous examination of all children who do not learn to read in the course of normal instruction. Much of the difficulty encountered by teachers of remedial reading is due to failure to differentiate between the child who has reading disability and the one who does not learn to read simply because he has not studied reading, or because of emotional conflict, or because of intellectual deficiency.

It seems that some individuals have virtually no control of eye movements for reading, particularly when emotionally disturbed. It is more likely that these motor impairments result from cerebral impairment than that the motor impairments are mere impediments to cerebration, or that they are consequences of any emotional disturbances. No amount of training will correct entirely the motor dys-functions of those with severe reading disability. (*M. H.*)

Krantz, H. C. A study of the relationship between maternal ancestry and the incidence of cleft palate in children, *Speech Abstracts*, 1944, **4**, 18.

The purpose of the investigation was to discover (1) whether the high rate of cleft palate in Hawaii is attributable to the low metabolic rates of Chinese and Chinese-Hawaiian mothers, who are representatives of racial groups of women whose average metabolic rates have been reported to deviate from the Harris-Benedict standard by -15% and -13%, respectively, and (2) to examine the relationship between the incidence of cleft palate in children and the amount and recency of color blending in maternal ancestries.

The following conclusions are reported. (1) Probability that cleft palate will occur in the "unmixed" racial groups ranged from highest to lowest: (a) Filipino, (b) Portuguese, (c) Hawaiians and Japanese, (d) Chinese, (e) Caucasians. (2) Mothers of relatively unmixed ancestry tend to produce fewer children with cleft palate than mothers of blended ancestry. (3) Variations in the incidence of cleft palate in children from one racial group to another are correlated with the number and recency of fusion of color fractions in the maternal ancestry. (4) There is no evidence that the high rate of cleft palate in the Islands is attributable to the offspring of Chinese and Chinese-Hawaiian mothers, representatives of racial groups who have been reported to have abnormally low metabolic rates. (5) It is highly improbable that cleft palate is caused by moderately depressed metabolic rates of mothers during pregnancy. (*Abstracted by Florence M. Henderson, Hawaii.*)

Löwi, M. Observations on comprehending, *The Amer. J. of Psychol.*, 1943, **56**, 129-133.

The author's purpose was to discover what psychological factors enable a reader to connect letters composing a word, and to investigate the question concerning those psychological conditions which permit the reader to integrate words into a sentence. An adequate account of comprehending calls for controlled conditions which force the subject to execute for himself, so far as is possible, the task of grouping the words in comprehension. Here short exposures help, for the subject then groups the words with difficulty, since the usual word sequence is partially masked, and the words may appear jumbled. The materials of this investigation consisted of five typewritten sentences made up of from 3 to 7 words each. The apparatus consisted of a slide projector and a telechron motor which rotated a paper disc in one second. A radial aperture in the disc exposed the projected sentence for 0.1 second. The sentences were presented to 40 college women. The words were spaced, but without punctuation or capitals.

The most noteworthy issue of the study is the discovery of many anticipatory and corrective means used, as distinguished from ready perceptive and memorial functioning. Under conditions and procedures of the experiment comprehension typically calls for anticipatory forecast and corrective scrutiny. (*M. H.*)

Palmer, M. F. Apraxia and agnosia in the speech of children, *Speech Abstracts*, 1944, **4**, 23.

A run of 300 speech defective children exclusive of those with definite brain lesions have been tested by a new test of tongue function for various symptoms of apraxia and agnosia of the tongue, and intention tremors of the tongue. It is next proposed to match these results with "normal" children of the same age, history, sex, and physical habitus. Apraxia and agnosia of the tongue, and intention tremors of the tongue occur in a surprising number of cases. The true significance of these findings cannot be ascertained until the control study has been completed. (*Abstracted by Martin F. Palmer, Institute of Logopedics.*)

Sallak, V. J. A community approach to the rehabilitation of the handicapped, *J. of Educational Sociology*, 1944, **17**, 342-351.

The author, who is a Field Secretary of the rehabilitation service of the National Tuberculosis Association, gives an interesting discussion of a Cleveland and Cuyahoga County project in the rehabilitation of the handicapped. Two problems are mentioned: the rehabilitation of civilian handicapped adults and children and the social and vocational rehabilitation of handicapped veterans returning to home communities. Of interest to the speech profession and to the Cleveland program, is the fact that speech difficulties are not once mentioned. Certainly the excellent program outlined must be fractional in its functioning unless speech is considered as a requisite for the unhandicapped individual in either the civilian or the post-military situation. (*Abstracted by Arthur Secord, Brooklyn College.*)

Spoerl, D. T. The academic and verbal adjustment of college age bilingual students, *J. of Genetic Psychol.*, 1944, **64**, 139-157.

At least at the college level, there are no continuing effects which stem from a bilingual childhood and which show themselves in academic records, vocational choices, or English ability of bilingual students. Neither does bilinguality seem to have any significant effect on the performance of college-age bilingual students on a verbal test of intelligence. If there were a bilingual handicap in childhood functioning in either academic or verbal adjustments it has certainly become stabilized by the first year of college. (*M. H.*)

Thorndike, R. L., and Gallup, G. H. Verbal intelligence of the American adult, *The J. of Gen. Psychol.*, 1944, **30**, 75-85.

The intelligence of the American adult was measured by the administration of a brief, steeply graded, untimed, multiple-choice vocabulary verbal intelligence test. The sample was the voting sample used by the American Institute of Public Opinion. The median was found to correspond to an Otis M.A. of a little over 16 years. The reliability of the test is estimated as .80 to .85. A small sex difference favors the women. This corresponds to previous studies in which women have excelled on verbal material. Age differences were small with a substantial drop in score in the "over 60" group. Widest deviation appeared in the three economic strata of under $20.00 a week, $20.00 to $39.99, and $40.00 and over. The respective median scores were 8.40, 11.3, and 13.6. (*Abstracted by Arthur Secord, Brooklyn College.*)

Journal of Speech Disorders, 1944, 9, 184-188

BOOK REVIEWS

ERNEST H. HENRIKSON, *Editor*
University of Denver

Editor's Note: Special attention is invited to A Pronouncing Dictionary of American English, here reviewed. For this book's unusual significance Book Reviews salutes Professors John S. Kenyon and Thomas A. Knott, its editor-authors, and G. & C. Merriam Co., its publisher. E.H.H.

KENYON, JOHN S. AND THOMAS A. KNOTT. A Pronouncing Dictionary of American English. Springfield, Massachusetts: G. & C. Merriam Co., 1944. Pp. lii + 484.

The most important fact about *A Pronouncing Dictionary of American English* is that it carries truth to the lair of old fictions. Devoted entirely to the colloquial speech of Americans, its aim, as phrased in the Preface, has been "to record without prejudice or preference several different types of speech used by large bodies of educated and cultivated Americans in widely separated areas and with markedly different backgrounds of tradition and culture." That aim, in the opinion of this reviewer, has been accomplished. The result is a distinguished, unique, useful book.

The words "without prejudice," "different types of speech," "widely separated areas," and "markedly different backgrounds" were applied to this book with truth. So was the following sentence: "Here let it be emphasized once and for all that we have no prejudice whatever either for or against any of these varieties of American speech." In other words, here is a dictionary which not only acknowledges and approves the existence of alternative pronunciations, but records them side by side. Plainly this is no book for the person who believes that there exists such a thing as "*the* correct" or "*the* standard" pronunciation of a word. It is a book for the person who is interested in "prevailing pronunciations" or who wants to learn "*a* prevailing pronunciation" of a word. Among dictionaries this is news, good news.

In the words of its Preface, this dictionary "is intended to include the great body of common words in use in America. Besides, it includes a great many somewhat unusual words . . . American proper names . . . many names of history and literature . . . foreign names . . . names of places in England . . ". Certain of these selections were designed to meet the "needs of college students," while other words are listed because of their "historical and traditional interest to Americans." Still others are included "not for their intrinsic importance, but for some interest or problem in their pronunciation."

Students of pronunciation should be pleased to find that this dictionary employs the phonetic alphabet of the International Phonetic Association throughout. It is difficult to predict the immediate effect of this practice among potential users who are unaware or unconvinced of its advantages. Certainly most speech specialists will applaud it as an additional reason why *A Pronouncing Dictionary* should replace other dictionaries as a pronunciation reference. At any rate, it seems probable that the use of the IPA in a dictionary devoted exclusively to pronunciation should increase the ultimate number of users. It is *Kenyon and Knott* IPA, of course, with idiosyncrasies that will not be approved by all. But this presents no obstacle to use; for the most part the phonetic practice is quite conventional. The excellent 35-page Introduction, a terse yet complete textbook of phonetics in itself, is a welcome contribution to that field.

It is important for the users of this book to understand the difference between it and the widely used *Webster's New International Dictionary*, another work in which Professors Kenyon and Knott participated, also pub-

lished by G. & C. Merriam Co. Apart from the fact that the present book is exclusively a pronouncing dictionary, there are three major differences. The first is in what is commonly termed the "style" of speech that has been represented. Pronunciations in the *New International* are those of formal platform speech, while *A Pronouncing Dictionary* records those of colloquial speech. At the same time the editors, stating that they have not prepared an altas of American dialects, are at pains to avoid "slovenly or careless speech." Those who hold that such distinctions are not rigid in details will appreciate the editors' acknowledgment that "the great majority of English words are pronounced alike in colloquial and formal speech," and that most of their transcriptions agree, therefore, with those of the *New International.* Few will dispute the fact of this close identity of the two "styles;" few, likewise, will argue that no differences exist. Where they do obtain they are recorded herein.

In its approach to the problem of connected speech the present book differs in a second major way from the *New International.* While the latter makes no attempt to record variations that arise when words are thus used, characterizing such an attempt as "impossible, even if it were desirable," *A Pronouncing Dictionary* does include many instances of "modified pronunciations brought about by the phonetic effect of words on one another" and "by rhythm, tempo, intonation, sense stress, etc." The editors' statement that they did "not attempt to do this completely," while certainly a fact, seems overly modest in its implication.

A pronouncing dictionary of *American* English would not live up to its title if it did not differ from the *New International* in a third respect. The present book "represents as fully as possible the main regional differences in America," it restricts itself to America, and it records non-American pronunciations only "occasionally and incidentally." The *New International* purports to represent cultivated pronunciations of English in the entire "English-speaking world." On the face of it such a scope seems much broader than that of *A Pronouncing Dictionary of American English.* In practice it is, of necessity, much narrower, a record of pronunciation being only one aim of the *New International.* Since the newer work is distinctively American, this reviewer would not have accused Professors Kenyon and Knott of excessive nationalism had they ended their title with its penultimate word.

That *A Pronouncing Dictionary* is neither a scientific record nor an aesthetic standard is not a matter for praise or censure; it is simply a fact. The assumption by any user that it is either of these is an error, responsibility for which certainly does not rest with the editors, who know and state clearly what they have produced. "The scope of this work is limited," they explain. The aim was "to record only what is rather vaguely called standard speech . . . It is not our purpose even to try to exhaust that field. Almost certainly we have omitted many 'good' pronunciations . . . there exists far greater variety than was formerly supposed in the speech of Americans of unquestioned cultivation and importance . . . The editors feel that on the whole they have been conservative in the variety recorded." The problem of standards is discussed as follows: " . . . the editors have endeavored to base the pronunciations on actual cultivated usage. No other standard has, in point of fact, ever finally settled pronunciation. This book can be taken as a safe guide to pronunciation only insofar as we have succeeded in doing this. According to this standard, no words are, as often said, 'almost universally mispronounced,' for that is self-contradictory. For an editor the temptation is often strong to prefer what he thinks 'ought to be' the right pronunciation . . . but in many cases the theoretically 'right' pronunciation of a word is not even current."

These, in summary, are the distinguishing characteristics of *A Pronouncing Dictionary of American English:* It is concerned solely with pronunciation; its subject matter is the body of common words; it transcribes pronunciations in IPA symbols only; it focuses on prevailing colloquial speech practice; it recognizes variations that arise in connected speech; it is restricted to the pronunciation of American by Americans; it represents dialects equally and without prejudice.

GRANT FAIRBANKS

State University of Iowa

SAMUELSON, ESTELLE (*Editor*). New Aids and Materials for Teaching Lip-reading, with Manual for Teachers. Washington, D. C.: American Society for the Hard of Hearing, 1943. Pp. 169. $1.50.

Lessons and manual in this book were taken from the material collected by teachers of the W. P. A. Lip Reading Project, through the courtesy of the New York City Schools. The manual contains instructions for both the grade teachers "Not Trained in Lip Reading Methods" and for those "Trained in Lip Reading Methods."

The first section defines lip reading and discusses the problem of lip reading, the goal of which is to enable a person to understand speech by "using his eyes and mind to help his ears." It is stated that lip reading is "an amalgamation of two process, physiological and psychological." The former process involves recognition and translation of the movement of spoken sounds into meaning, but certain obstacles are present, such as speed of articulation, barely visible or completely invisible movements of different sounds, similarity of several sounds and variation in pronunciations of words and in mouths of speakers. These obstacles are overcome by psychological factors, such as intuition and synthesis. An example of the former is an anticipation of the subject of conversation through awareness of time, place, location, persons speaking, etc. Synthesis is a delayed comprehension; that is, the probable thought is deduced from certain clues in the conversation, aided by intuition. Then the whole thought suddenly becomes clear after the missing (invisible) words have been filled in.

Comprehension of speech is increased by formal exercises which are intended to develop casually skill in recognizing speech movements. Perception of speech movements later is submerged in perception of thought in a manner similar to one who writes language rather than attends to the curves and lines of handwritten letters. Formal lessons are intended for children from the third grade up. Exercises and word drills are intended to train the eye and the mind. In these lessons the child is made aware of variations of speech movements. Informal lessons are intended for the younger children, who are taught without any mention of the types or names of lip movements.

The chapter for trained teachers of lip reading gives new material and techniques. It contains a discussion of visibility of words and sentences which is most helpful in presenting suitable material to children.

The rest of the textbook is devoted to 28 lessons based on as many speech movements. The sentences were prepared from the materials obtained from 50,000 sentences which were constructed by school children. Hence, the sentences are in such variety that appropriate ones can be used for each grade. It should be stated that these lessons are merely a systematic guide for the teacher in presentation of classified speech movements. Many suggestions are given on the preparation of materials to supplement the prepared sentences.

The textbook enables untrained and trained teachers in urban or rural areas to give lip reading to hard of hearing children. An adult may use it for his own instruction or for training a child at home. In general, this book permits persons in isolated areas or graduates of schools or colleges to train themselves or others in the art of lip reading.

W. H. GARDNER

California State Department of Public Health

BAKER, HARRY J. Introduction to Exceptional Children. New York: Macmillan Co., 1944. Pp. xiv + 496.

This book, written by the Director of the Psychological Clinic of the Detroit Public Schools, "is intended to present the characteristics and problems of all types for exceptional children." It is designed to provide an introduction to the field for prospective teachers, administrators and others interested in the exceptional child. There are eleven chapters on various types of physical handicaps, five on problems of mental growth and development, three

on neurological and psychogenic disorders, five on behavior maladjustments and two on educational retardation. The incidence, diagnosis, etiology, management and educational problems of each of these conditions is discussed.

The chapter on defective speech, which is classified as a physical handicap, covers the definition, incidence, diagnosis and causes of defective speech, its relationship to intelligence and personality, and the organization of speech correction work in the Detroit Schools. For those not familiar with the field, this should provide a useful orientation. The chapter is marred by a table purporting to show the relationship between diagnostic and remedial procedures, in which such things as stuttering and rhinolalia are listed both as diagnostic and as remedial procedures.

There are occasional errors elsewhere in the book. Diplopia is cited as a cause [*sic*] of general paresis (p. 51); the basilar membrane is located in the semi-circular canals (p. 54); spastic speech is listed as a psychogenic disorder (p. 137); and Broca's area is located in the right hemisphere in right-handed persons, with the handedness center in a corresponding position in the left hemisphere (p. 201). On the whole, however, the errors are few and a great deal of material from a wide variety of sources has been accurately and effectively condensed.

The book is interestingly written, clearly organized and well illustrated. There is a particularly good discussion of behavior problems and of the problems of the mentally retarded and mentally gifted. Those interested in the exceptional child will find this a useful survey of the field.

C. R. STROTHER

State University of Iowa

COBB, STANLEY. Borderlands of Psychiatry. Cambridge, Mass.: Harvard University Press, 1943. Pp. 164 + xiii.

This volume is an edited and somewhat more technical version of the author's lectures before the Lowell Institute in 1940. It is a remarkable collection of papers which defines a series of therapeutic problems which belong to no single field of medicine or psychology, but which are truly psychosomatic.

"Causation" for most disorders is multiple for Dr. Cobb. For the sake of a 1943 definition (and no other) he outlines four etiologic factors: genogenic (hereditary), histogenic (structural), chemogenic (chemical), and psychogenic (psychological). Around this core he weaves his delightfully penetrating miniature treatises on speech, emotion, consciousness, epilepsy, psychoneuroses and psychosomatics.

To the speech pathologist, Dr. Cobb's discussions of the evolution of speech, and the disorders of speech, will seem too brief. Only a portion of the papers deal with speech *per se;* but, then, only a portion of the lands bordering psychiatry are fields of speech. The soil of these lands, to Cobb, is chiefly neurologic, and any geophysical exploration of them would yield finite neural centers for finite psychic functions. In a day when many are talking about organisms as wholes, this treatment may be healthy—so long as the reader does not assume that the author implies finality of statement. The discussions of nuclear and supra-nuclear paralyses, etc., must deal with such neural specificity. The evaluation of the aphasias, however, becomes more specific than some respected modern authors would encourage. This semi-return to more classical views, without mention of Weisenberg's monumental offerings, is going to amaze some readers. Their amazement may serve to remind them that aphasia is not a closed problem.

Stuttering (i.e., stammering, as used in the text) is to be linked with the Orton-Travis lateral dominance hypothesis. Nevertheless, the etiologic core of stuttering includes as relatively certain only the genogenic and the psychogenic variables; the chemo- and histogenic are questionable.

Not all stuttering is defined etiologically as equivocal cerebral dominance; there is also "psychoneurosis with stammering," which results from failure of what Dr. Cobb calls the highest cortical control levels, those underlying

inter-personal relationships. In spite of this dichotomous view of stuttering, the author brings a wealth of experiential detail to bear on the problem. Certain passages, which appear almost as asides, contain incisive remarks of value to the speech correctionist.

It is to be hoped that those actively engaged in clinical speech will read this volume in its entirety, and that they will read it essentially in the spirit in which it was written—that of exploration. As the author points out, the field of speech pathology "is controversial, and no sound practice can emerge until the medical profession and the psychologists get together and do some significant investigation" (p. 37). To contribute to the achievement of this millenium, the non-medical speech pathologist can here discover that the multiple factors of etiological significance do not exclude his offerings—and the medically trained can here learn that these offerings are not to be rejected.

JOHN R. KNOTT

State University of Iowa and the
Iowa State Psychopathic Hospital

BRYNGELSON, BRYNG, MYFANWY E. CHAPMAN, AND ORVETTA K. HANSEN. Know Yourself—A Workbook for Those Who Stutter. Minneapolis: Burgess Publishing Co., 1944. Pp. 53.

Now and then a book appears that is really different. "Know Yourself—A Workbook for Those Who Stutter" is such a book.

Whatever the pet bias as to method the teacher may have about stuttering he will find this book valuable, for it is developed around basic principles of mental hygiene which are used by all teachers. The central purpose of the book is to help the stutterer to understand and face his problem more objectively and to gain greater control over his speech. These objectives are carried out through a series of practical, down-to-earth discussions and activities which start at the level of the child involved and gradually move up through a sequence of assignments that progressively develop his insight and control.

Amazingly the book avoids all controversies in the field—the handedness controversy, the bio-chemical controversy, or any other.

The style is informal and the approach direct and personal. For example: Lesson One, "Why We Go To Speech Class," begins, "Most cars have electric starters. Sometimes when the driver steps on the starter nothing happens . . . When some people try to speak, something happens to their voice which reminds us of the car starter."

Tested in actual public school classes, this material can be used effectively with individuals and with groups. This book will unquestionably become a "must" on the list of materials for speech correctionists. It may well serve as a pioneering work to stimulate the development of similiar materials for a variety of speech defects.

E. H. HENRIKSON

University of Denver

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WAR NOTES

HERBERT KOEPP-BAKER, *Editor*
The Pennsylvania State College

During the past three months the Office of Vocational Rehabilitation of the Federal Security Agency has been holding a series of special regional conferences. Mr. John A. Kratz, Associate Director of the Office of Vocational Rehabilitation, reports that the primary purpose of these conferences is to clarify the status of vocational rehabilitation on state and national levels under the new legislation enacted some months ago.

Another problem to be resolved by these conferences is that of the inter-relation of services between the Veterans' Administration Facilities and the Social Security Program. Large numbers of veterans are now receiving a variety of services through vocational rehabilitation on the state level, and it is likely that these will grow. These conferences are of interest to the ASCA since the new Social Security legislation makes provisions for physical rehabilitation. This includes seriously handicapping speech disorders alone or when associated with other physical disabilities. It also provides for specialized speech rehabilitation in those approved cases in which the outcome of total vocational restitution depends upon improved speech.

Since it now seems probable that the Veterans' Administration will also undertake a program of rehabilitation in speech and hearing, it is important that certain boundaries defining service relations in this area between these two organizations be worked out. Representatives of the ASCA have attended or will attend these regional conferences. Dr. Ernest H. Henrikson represented the Association at the meeting in Denver on March 20-22. Prof. Samuel D. Robbins will represent the Association at the conference in Boston, on May 1-3, and President Bryng Bryngelson will attend the conference held in Minneapolis, on May 11-13.

Three Army hospitals have, up until now, been assigned responsibility for rehabilitation of the deafened. They are: Hoff General Hospital, Santa Barbara, California; Borden General Hospital, Chickasha, Oklahoma; and Deshon General Hospital, Butler, Pennsylvania.

The following hospitals have been designated for neurosurgical cases:

Tilton General Hosp., Ft. Dix, N. J.
Walter Reed General Hosp., Washington, D. C.
Kennedy General Hosp., Memphis, Tenn.
Lawson General Hosp., Atlanta, Ga.
Ashford General Hosp., White Sulphur Springs, W. Va.
Nichols General Hosp., Louisville, Ky.
Percy Jones General Hosp., Battle Creek, Mich.

Fitzsimons General Hosp., Denver, Colo.
O'Reilly General Hosp., Springfield, Mo.
Schick General Hosp., Clinton, Iowa
Brooke General Hosp., Ft. Sam Houston, Texas
McCloskey General Hosp., Brigham City, Utah
Hoff General Hosp., Santa Barbara, Cal.
McCaw General Hosp., Walla Walla, Wash.

Plastic Surgery Units have been assigned to:
Valley Forge General Hosp., Phoenixville, Pa.
O'Reilly General Hosp., Springfield, Mo.
Wm. Beaumont General Hosp., El Paso, Texas
Bushnell General Hosp., Brigham City, Utah
Letterman General Hosp., San Francisco, Cal.

Reports from the Neurosurgical and Plastic units indicate that only occasional cases of speech disorders are found among their admission lists.

At present the Hearing Unit at Deshon General Hospital represents the most complete unit of its kind now in operation. Even there, however, it still functions with an incomplete staff. The final plans for this Unit include a Chief-of-Service and an assistant for the rehabilitation of the deafened and the hard-of-hearing. It also provides for an acoustic expert who is to be responsible for the fitting of hearing aids by acoustic physicists and for supervision of the instruction in lip reading.

The plan also calls for a clinical psychologist who is to help to integrate the total services and to provide psychological examination and counsel for the patient from the time of his admission to the time of his discharge. Under the plan the clinical psychologist is to have charge of speech rehabilitation in the Unit. He will also assist in vocational adjustment upon admission of a patient to a Veterans' Facility or return to civilian life. The post of clinical psychologist at Deshon Hospital has not been filled as these notes go to press. The principal of lip reading instruction now temporarily provides this service. Deshon Hospital now employs, under Civil Service, two speech correctionists in its Hearing Unit. Sixteen lip reading aides are now on duty there.

The Coordinator has spent some time in this hospital. He found that under its program each new patient is interviewed as he is admitted to the hospital. In this interview an attempt is made to orient the person to the total program of rehabilitation. Lip reading is explained. Hearing aids, if recommended, are provided and the person is urged to use his residual hearing to supplement lip reading. Daily classes in individual lip reading instruction are provided for each patient. Each period is usually fifteen minutes in length. Some group work is being organized for practice in conversation. Speech correction is provided at various stages of treatment.

The Borden General Hospital at Chickasha, Oklahoma, has not yet appointed a principal for its lip reading and speech correction services. The roster of aides at Borden General Hospital is incomplete. It now represents a staff of ten which is under the supervision of Major Leslie E. Morrissett.

In a letter written by Mrs. Isabelle Demarest, now in service at its Hearing Rehabilitation Unit, and directed to Miriam D. Pauls, appears the following interesting paragraph:

> The work is vital and fascinating. It seems to me that the other lip reading teachers have performed "miracles." The men who have been assigned to me are bitter, afraid, and hopeless. The men who have graduated after eight weeks are joking and laughing and strutting around with hearing aids like turkey cocks.
>
> It gives one faith that this phase of the rehabilitation problem is being adequately handled.

All appointments to Army hospitals are now made through the regional offices of the United States Civil Service Commission. The Commission has worked out the following salary scale:

> Speech Pathologists: starting salary $2600 per annum, plus overtime' which amounts to $3163 a year based on a standard 48-hour week.
>
> Instructors to the Deaf: $2600, plus overtime, amounting to $3163.
>
> Acoustic Experts: $4426 per annum, based on a 48-hour week.
>
> Physicists: $5228 per annum, based on a 48-hour week.
>
> Clinical Psychologists: $5228 per annum, based on a 48-hour week.

Only one principal or supervisor of lip reading will be assigned to each hospital. Two of these vacancies have not yet been filled. The Office of the Surgeon-General predicts that probably 75 to 100 teachers of lip reading will be required for the three hospitals when its program is fully underway. The Coordinator urges members of the Association who have had training and experience in lip reading to apply immediately, through their regional offices of the Civil Service Commission, for one of these positions as lip reading instructors. He also urges members of the Association who are now partly qualified to extend their training and experience as quickly as possible so that they may qualify for such a position. (Information concerning the 1944 summer session training programs of several colleges and universities is to be found in the News and Announcements section in this issue of the *Journal.*)

Since most of the work of speech pathologists in Army hospitals is likely to be intimately related to services to the deafened, the Coordinator urges speech pathologists to gain preparation in the field of hearing disabilities. In addition to the two categories of lip reading aides and speech pathologists a third category is developing. This consists of teachers who have *both* speech correction and lip reading training and experience and who could function in both areas. A number of such positions are now opened to the applicants.

The qualifications for all categories as set up by the Civil Service Commission follow:

Speech Pathologist

Duties:

Organize classes in correction of speech; do individual remedial work with cases of speech disorders, both functional and organic.

Requirements:

Must have a thorough knowledge of organic and functional speech defects, viz: Asphasia, Cleft Palate, Cerebral Palsy, the Hard of Hearing and Functional Articulation Disorders.

B.A. Degree in Speech Pathology, or an equivalent field, from an accredited University. Three years' experience teaching correction of speech.

Assistant Instructor to the Deaf

Three years' full-time paid experience teaching lip reading, or a minimum of two years of such experience with substitution of education or completion of advanced technical courses for experience. The above is in addition to the demonstration of statisfactory education in the language function, including speech correction. Extensive training in speech correction will probably be accepted as a part of the total requirements since the need for lip reading instructors is great.

Speech Correction-Lip Reading Aides

A combination of the training listed for the two above categories, representing a proportion of approximately one-half speech correction and one-half lip reading and associated subjects.

Acoustic Physicist

A thorough knowledge of the designing, assembling and use of electronic equipment for the various tests of hearing. Must be familiar with characteristics and physical performance of Council-Accepted hearing aids. Capable of scientifically fitting hearing aids in the light of patients' hearing tests, such as: Audiogram, equal loudness tests, tolerance meter tests, diagnostic amplifier or master hearing aid. Supervision over Acoustic Sections of the Service for Rehabilitation of the Deaf and Hard of Hearing.

Acoustic Expert

Knowledge of audiometer testing and retesting; conduct hearing aid tests; knowledge of making ear mold impressions; hearing and fittings maintenance and supplies; supervision of fittings and conferences with hearing aid representatives; supervision of selection and purchase of, or prescription for, hearing aids; responsible for recording and maintenance of acoustic department records.

Psychologist

Should have Ph.D. degree in Psychology with a minimum of two years' practical experience as clinical or public school psychologist; or substitution of additional practical experience for education. Should have emphasized the psychology of language in training and experience. Should present transcript of college and post-graduate work as well as record of employment.